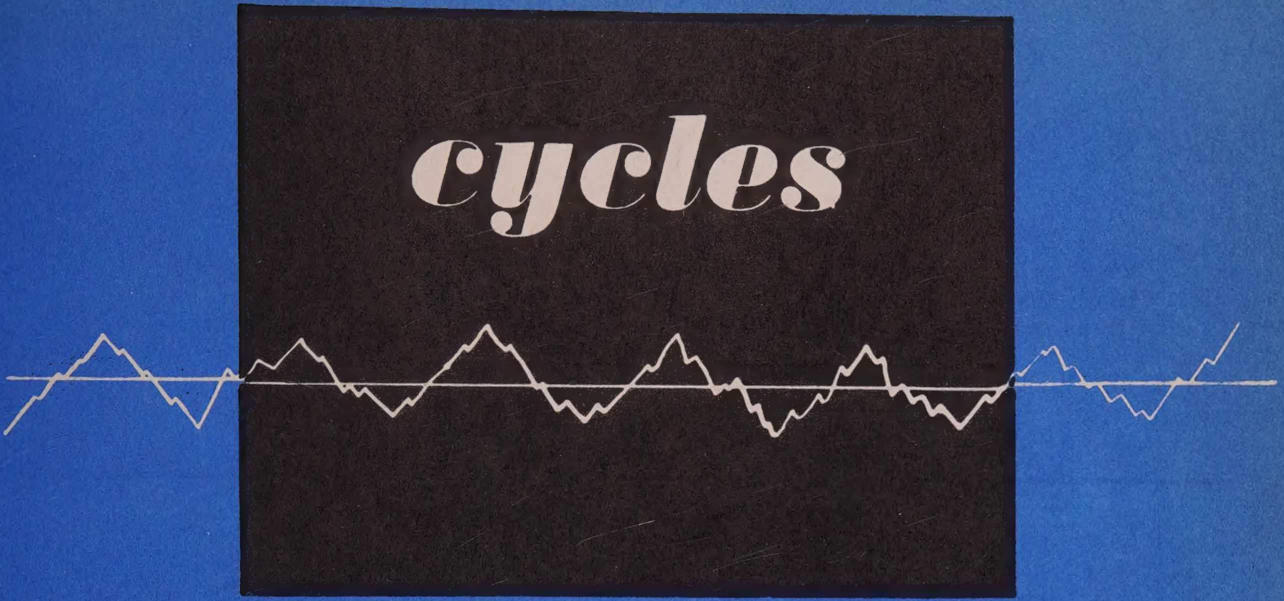
cycles



November 1955

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

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cycles

The official Bulletin of
the Foundation for the
Study of Cycles

VOLUME VI NUMBER 9 NOVEMBER 1955

The Director's Letter

Dear Member:

There is an article in this report about the bisection periods of the planets which is too dull to read but too important to ignore! Suppose I tell you about it here, so that you can skip the actual reading of it, unless of course you happen to like that sort of thing.

Meterologists have been mystified for years by the fact that certain aspects of weather—thunderstorms in Canada for example—have cycles which behave as follows: First of all the cycle repeats time after time for a certain number of years. Then, all of a sudden, the cycle flops upside down, with crests coming where troughs "ought" to be, and vice versa. Economic data sometime behave the same way.

How could such behavior be caused? So far no one has been able to figure it out.

In the article about the bisection periods of the planets I call your attention to something in nature which does behave in just exactly this way. I have christened this thing an "interior bisection of a planetary angle." The article explains what this term means. However, you do not need to understand the term to realize that here, for the first time, we have something in nature which we know is not random which behaves in this peculiar regular-irregular way.

Cycles Present

Now we do not yet know that the planets, directly or indirectly, have anything to do with weather. But we do know that these interior bisections of planetary angles come in cycles. We know that these cycles flop upside down at intervals just like the thunderstorms. We know that in the case of the planets these intervals are regular and predictable. And we know that various planetary angular relationships, including certain bisections, are associated with disturbances in what is known as radio weather—that is, radio blockouts and radio fadeouts. If radio weather is disturbed, maybe ordinary weather is disturbed. If ordinary weather, then maybe other things too.

All of this being so, it looks as if it might be worth while to take the time to see if the thunderstorm and economic cycles flop upside down at intervals and at times corresponding to the planetary cycles which behave the same way. Maybe its a false alarm; on the other hand, maybe we are on the track of something that will throw a good deal of light on the cause of at least certain cycles and on how they operate.

Multiplicity of Cycles

The article is important for a second reason. The multiplicity of the cycles listed in Table 1 shows how horribly complicated the subject of cycles is. It may explain why, if bisections of the planetary angles are in anyway associated with weather and with other things, this fact has not been discovered heretofore.

As for the rest, the article gives the serious student a great mass of reference material so that he can run down the leads suggested above.

These comments tell you why the article is worth printing, even though it is too dull too read!

The Report

It occurs to me that you may be interested in the details involved in the production of a report. All this work is done in Pennsylvania at Bradys Bend. My friends call it Bradys End, it is so far away. The post office is at East Brady, a little town about 60 miles north of Pittsburgh.

The clerical work involved in the research and the charting of a story is done by Hazel Jones and Myrna Hankinson. These two gals work part time on the various projects as required.

I grub out the text long hand. It is then typed by Margie Stevens, a typist who works part time on the report. I read the typescript and try to improve the wording. Margie then types it over in what we call varitype form. This means in lines not more than 42 characters long. At this point I re-read and recheck. Margie then copies it on the varityper, which stretches out the lines so the right hand margins are even. I read it again to check the varityping.

While all this is going on Lorraine Sherwin, my secretary (and often my boss) lays out the story so that charts and text are attractively arranged. She sees to it that things come out even. If a story is too long I sometimes have to cut it a little so that it will go into the available space, or she will say ‘I need two more lines to make this thing come out even.”

Lorraine or Margie then cut the varityped material into column lengths and paste up the pages. The headings are set in Fototype—cardboard letters—pasted on to the page. I re-read again for final O.K.

This process is repeated for each story.

When all 32 pages are complete (the middle Friday of the month) we send the whole kit and kaboodle registered mail to Braun-Brumfield in Ann Arbor, Michigan, for printing. This firm prints by the offset method and reproduces exactly what we send them, eRrOrs and all (see what I mean?).

Two weeks later they deliver about 5,500 printed copies to Dr. Leonard Wing who also lives in Ann Arbor. Five thousand five hundred reports makes a stack about 36 feet high.

Dr. Wing and his four children, Billy, Tommy, George, and Anne, paste on the labels (at a penny a lick), sort by city and state, bundle, and deliver to the post office on Sunday. Uncle Sam takes about two weeks to deliver to you.

The labels reach Dr. Wing from Mrs. Gertrude Roessle, manager of the New York office and head of the membership plan. They are run off from our own plates on our own addressograph machine in New York by Dora Pearson who has charge, on a part-time basis, of that end of the work. The plates are made from membership records kept by Elizabeth Rothenberg, a Columbia student who also works on a part time basis.

And now, the round having been completed, we must hurry to get started to do the same thing all over again for next month. No peace for the wicked!

Cordially yours,

Edward R. Dewey

Director

THE 3 1/2-YEAR CYCLE IN GENERAL BUSINESS

SOME years ago I printed for you an article about the 3 to 3 1/2-year cycle in general business 1790—1946.

This article showed you that when the index of American business since 1790 was filtered in such a way as to smooth out minor cycles and minimize longer cycles a cycle about 3 1/2 years long remains.

The manipulation of the figures was made by Mr. W. C. Yeatman of Los Angeles, a member of the Foundation since its membership plan was instituted.

Techniques used by Mr. Yeatman in the smoothing and filtering process were described in detail in *Cycles* for November 1950. This technical material will not be repeated here. Those who are interested in the technical aspects of the article should refer to the earlier report. The filtering process was applied to the Cleveland Trust Company Index of American Business since 1790. This index is reproduced on the two pages next following as Figure 1.

Mr. Yeatman's original work was done in 1947 with figures through 1946. It is reproduced as Figure 2 on the pages following. As the process of manipulation loses figures at each end of the series, Figure 2 starts in January of 1800.

Mr. Yeatman has now brought his work up to date and has added to his chart the cycles which have unfolded since his original work was done. This later work is shown by means of a heavy line to distinguish it from the earlier work. Although figures through 1954 have been used in this later work, the chart itself goes only to September 1948 because, as mentioned above, the process of filtering loses values at each end of the series. It can be seen from the chart that the cycle is continuing, but at a somewhat reduced amplitude, at least in comparison with the period 1900 through 1933.

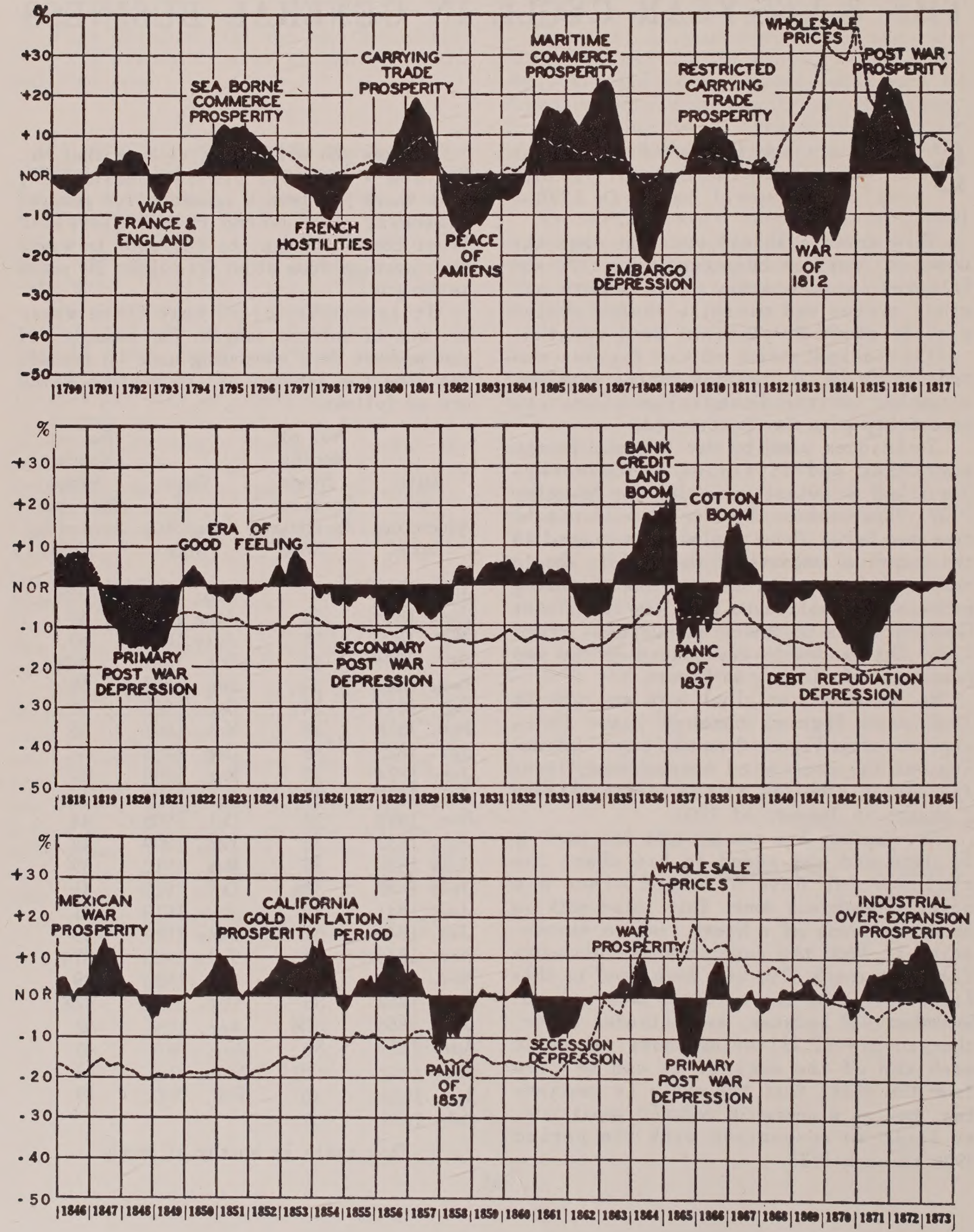
I think you will agree with me that Mr. Yeatman's analysis proves conclusively that there has been a tendency for general business, as measured by the Cleveland Trust Company Index, to fluctuate in waves that average from about 3 to about 3½ years in length.

It is equally clear that these waves are not of uniform length. For example, if you measure from ascending node to ascending node the lengths of the various waves are as follows:

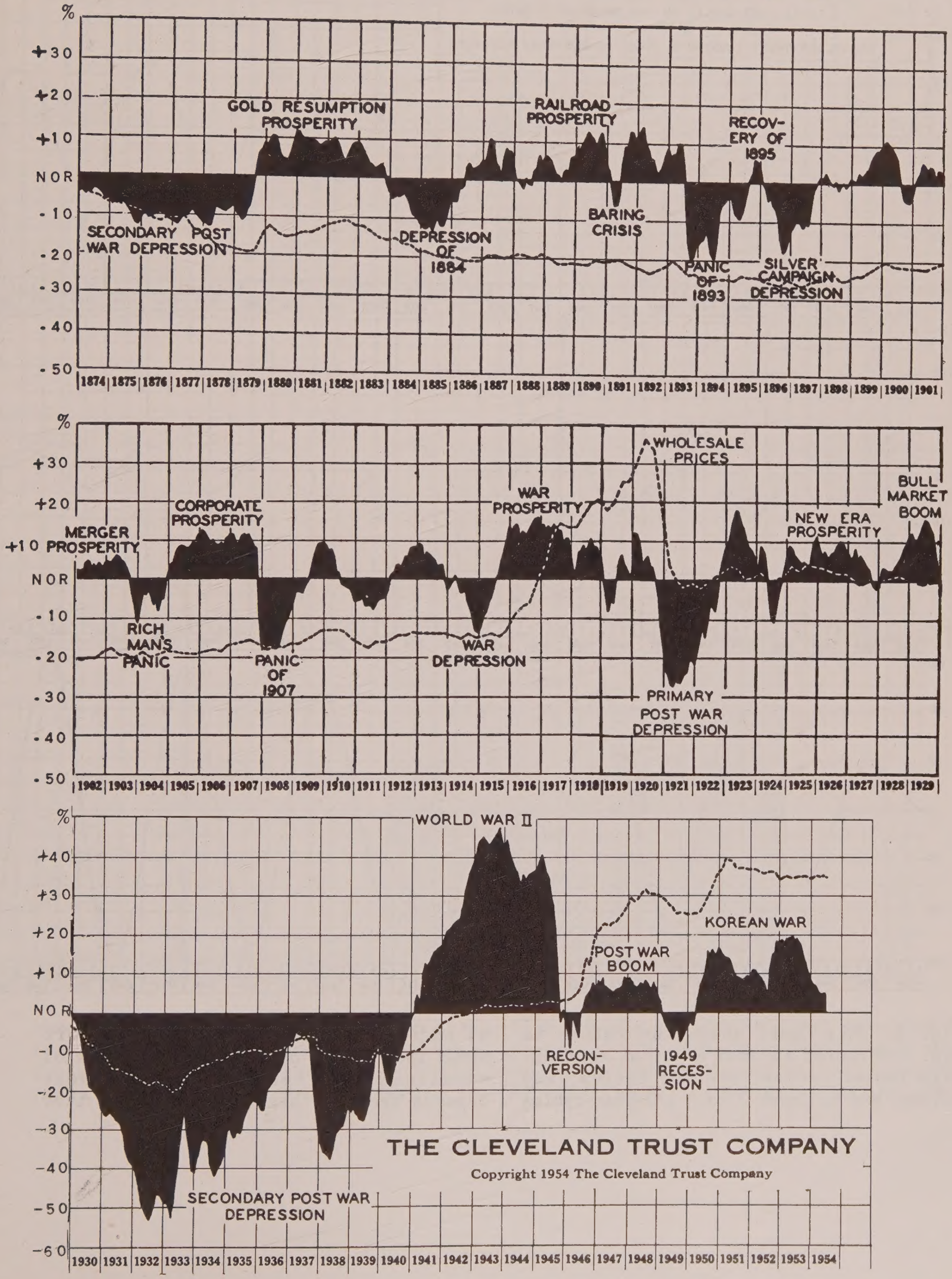
Date of Ascending Node	No. of Months Since Previous Ascending Node	Date of Ascending Node	No. of Months Since Previous Ascending Node
July 1800	--	Feb. 1872	35½
June 1803	35	June 1875	40
May 1806	35	July 1879	49
Apr. 1809	35	Oct. 1882	39½
Feb. 1812	34	Dec. 1885	38
Dec. 1814	34	Dec. 1888	36
Feb. 1818	38	Nov. 1891	35
Apr. 1821	38	Dec. 1894	37
June 1824	38	Mar. 1898	39
July 1827	37	Feb. 1902	46½
Nov. 1829	28	Oct. 1905	44
July 1832	32	Feb. 1909	40
July 1835	36	May 1912	39
July 1838	36½	Oct. 1915	41
June 1841	35	May 1919	41
Jan. 1844	31	June 1922	39
Nov. 1846	34	July 1925	37½
Nov. 1849	36	Oct. 1928	39
Nov. 1852	36	Oct. 1932	47½
Jan. 1856	37½	Apr. 1936	42
Apr. 1859	39	Aug. 1939	40
Sep. 1862	41½	Nov. 1943	51
Jan. 1866	40	Feb. 1947	39
Feb. 1869	37		

This table is worthy of study.

Fig. 1. AMERICAN BUSINESS



ACTIVITY SINCE 1790



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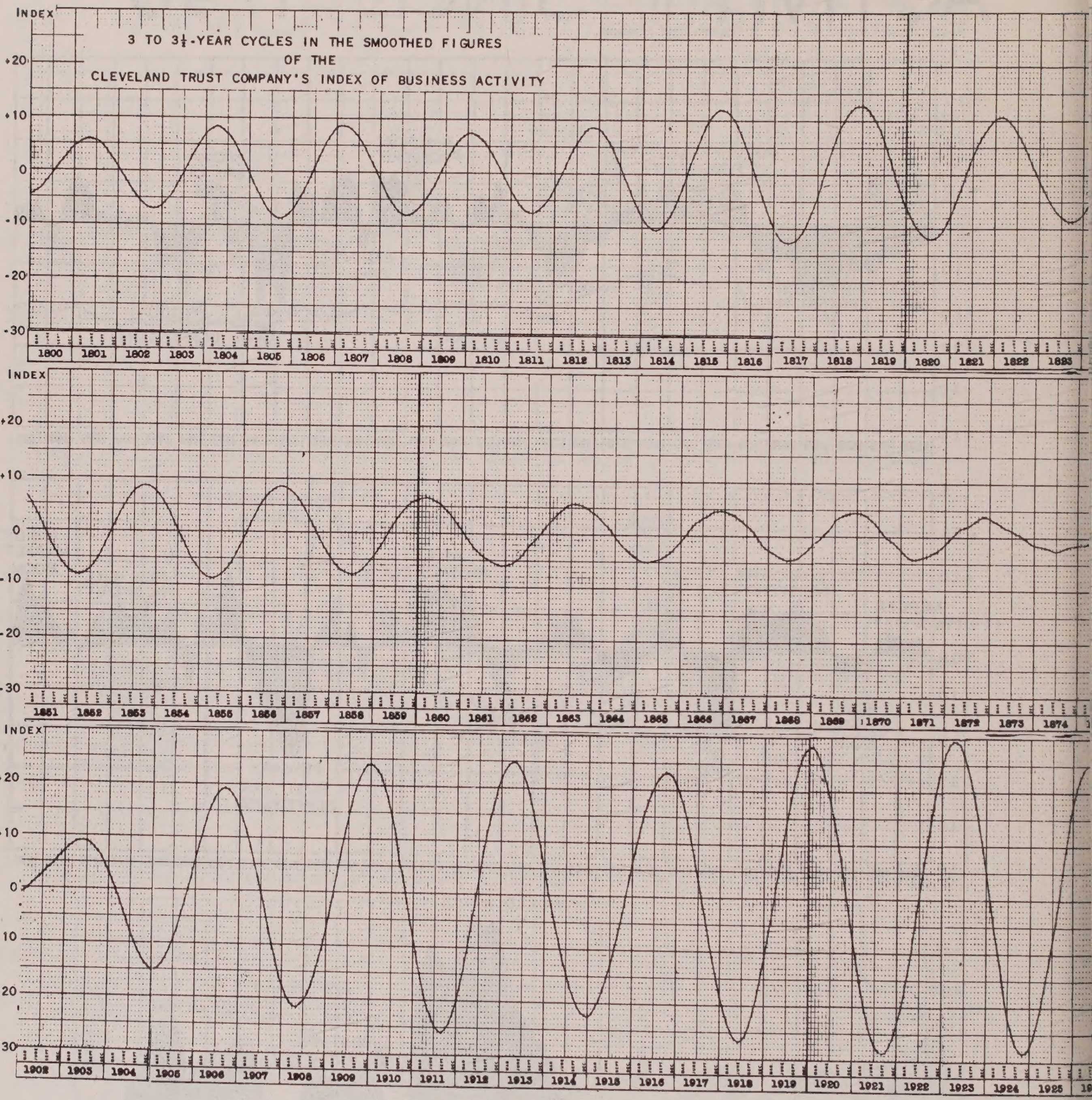
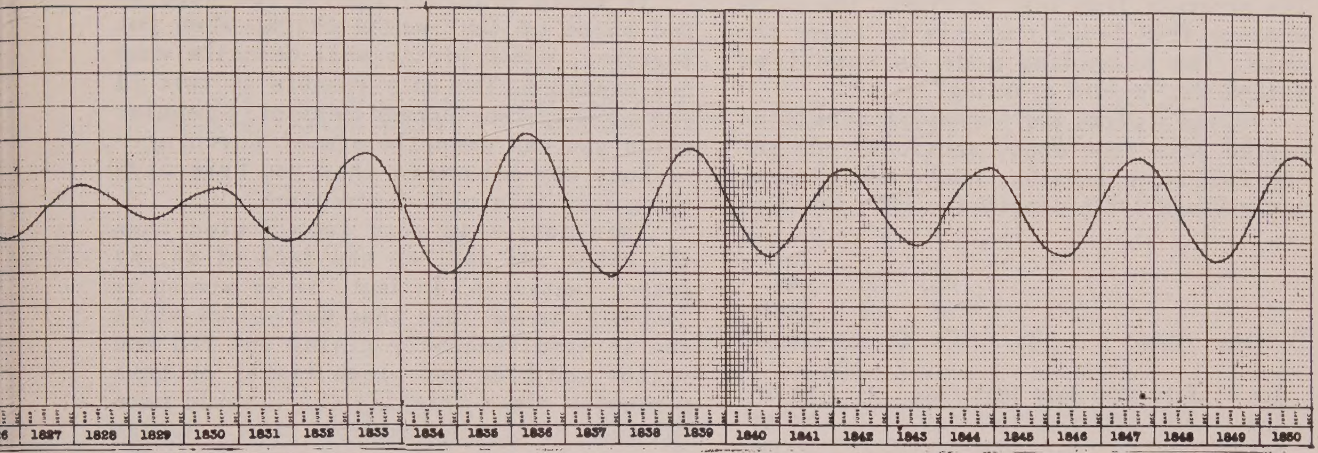
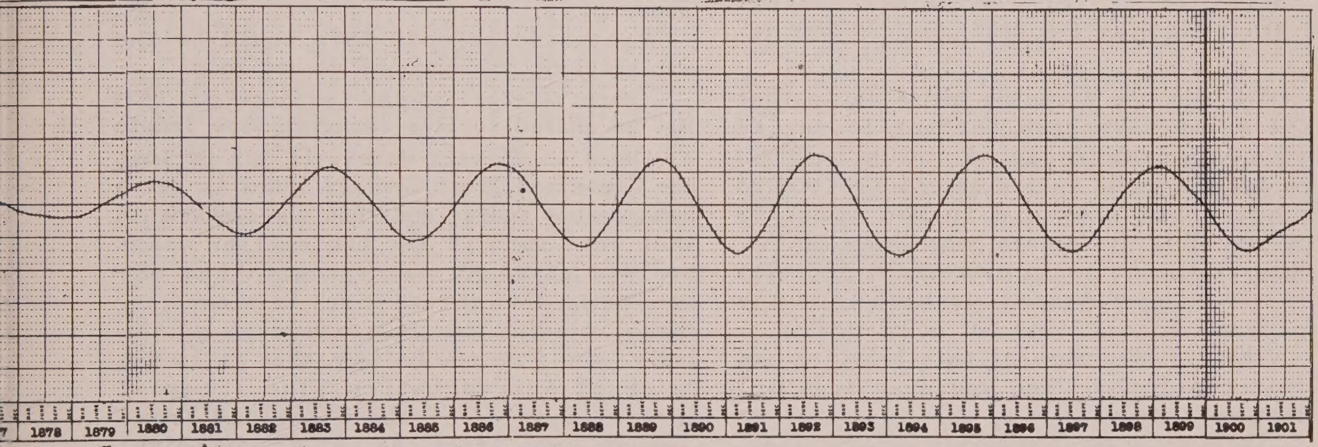
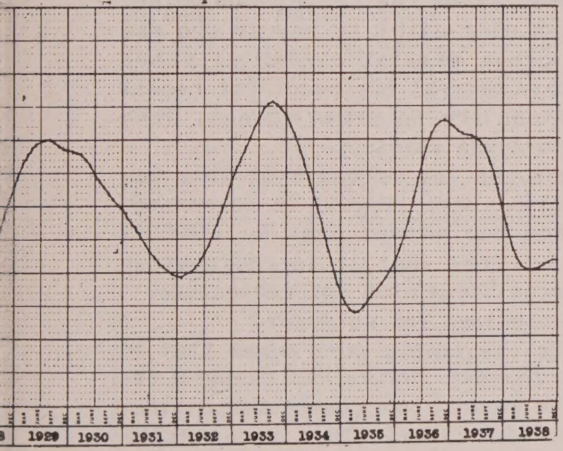
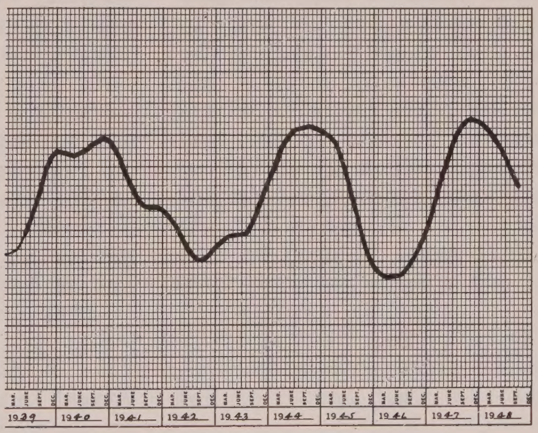


Fig. 2. This chart shows the values in Fig. 1 filtered in such a way as to minimize longer cycles, shorter cycles, and randoms and to leave 3 to 3 1/2-year cycles as undisturbed as possible. This chart shows that cycles of this general order of magnitude have been present in these figures from the beginning but that they









have varied greatly in strength and that the average length has increased from about 3 years to about 3 1/2 years over the 260 years of experience. The data start in 1790 and run through 1954 but this curve starts in 1800 and ends in 1948 because the smoothing process loses a certain number of values at the beginning and at the end.

(The ascending node is the time when, in its progress from left to right, the curve crosses from below the axis to above the axis. The ascending node is sometimes called the "upward crossing".)

If you divide the curve as nearly as may be into four equal sections, you get the following lengths, number of cycles, and average cycle length for each section.

Section	From	To	No. of Mos.	No. of Cycles	Av. Cycle Length
1st	July 1800	July 1832	384	11	34.91
2nd	July 1832	Feb. 1869	439	12	36.58
3rd	Feb. 1869	Oct. 1905	440	11	40.00
4th	Oct. 1905	Feb. 1947	496	12	41.33

You can see from the above Table that the waves have been getting longer as time has progressed. For the last 23 cycles the waves have averaged 4.91 months longer than they did in the first 23 cycles. This difference amounts to 13.73%. This statement is an over-simplification of a very complicated problem, for the increase in length has not been regular.

What is the cause of this behavior and what conclusions can you draw from Mr. Yeatman's study?

There are several possible explanations. For example, the cause may be purely dynamic and may lie wholly within the business structure. Something or other may cause business to fall off. It falls off too much. Then it hurries to make up for lost time. It overexpands. Then it falls off again. And so on, time after time. On the average, it takes 3 to 3½ years for the cycle to come a full turn. It used to take an average of 34 and a fraction months for the cycle. Now it takes an average of about 41 months for a cycle.

That would be the simplest explanation, and perhaps it is the right one. I do not know.

Another explanation could be that there are several rhythmic forces of from 3 to 3½ years in our environment (as in truth there seem to be). Sometimes two of these forces offset and neutralize each other leaving the third one in control. Then, as time goes on, the third one is offset and neutralized by one of the first two, leaving the other in control, and so on.

It would probably not be too hard to find three or four waves which, when put together, would pretty well describe what has happened. The only trouble is that if you put together enough perfectly regular waves you can describe almost anything—without any assurance that you have anything more than mere description.

This notion is more complicated than the other one and, on the face of it, is rather fantastic. In fact, it is almost as fantastic as the idea that our yellow-white sun is simultaneously giving out red and yellow and blue and green light, or that perfectly clear drinking water could have hundreds of little invisible bugs swimming about in it.

Fantastic or not, this could be the explanation; but again, I do not know.

There is still another explanation that may be offered for the changing wave length of the 3 to 3½-year waves. It may be that the Cleveland Trust Company index is not a homogeneous index, and that the components that went into it for the earlier years had one rhythmic pattern and that the components that go into it now have another. There is merit to this criticism of the index, but I do not believe that it is the cause of our variation. The internal inconsistencies of the Cleveland Trust Company index (from the cycle standpoint) would give a nice alibi to anyone who was trying to prove regular cycles of about this length in general business. But honest workers do not try to prove things. They try to find out the facts.

Therefore, as far as cause of this behavior (varying wave length) is concerned, I think then our answer must be that as yet we do not know what it is and that as yet we have no basis even for conjecture.

What conclusions can we draw?

To me, Mr. Yeatman's work means that as this 3- to 3½-year rhythm has changed its length in the past, it is likely to continue to do so in the future. That is, I think the probabilities are that the time will come when this rhythm in general business will cease to be 41 months in length.

Whether or not this time is here, and if so, whether the new length will be longer or shorter, I do not know. However, we are put on notice that we must always be on our guard until we know more. *E.R.D.*

BISECTION PERIODS OF THE PLANETS

AS I told you last month, John Nelson has discovered that radio weather is alternately good and bad in cycles. This article will tell you something about the length of these cycles. Perhaps you will find these cycle lengths in the figures in which you are interested. If so, please let me know.

Nelson is Propagation Analyst for RCA Communications. It is his job to forecast "radio weather." *Radio weather* refers to the ease with which radio waves can be transmitted. You might say it refers to the amount of static and to the amount of fading.

Radio weather is important to all of us who have radios. It is particularly important to those people whose job it is to transmit radio messages over the Atlantic and the Pacific Oceans.

Forecasts 92.2% Accurate

Using a knowledge of these cycles and other information Nelson has been able to forecast radio weather with amazing accuracy. For example, last year he made 1,416 separate forecasts (six forecasts for each working day). Of these forecasts, 1,305 were right. This is 92.2% accuracy! Don't you wish you could do as well with the things *you* try to predict?

What are the cycles that Nelson uses to enable him to make these amazing predictions? They are associated with the angular relationships between the planets. Some of the cycles Nelson uses are the time intervals between consecutive angular bisections.

An angular bisection occurs when one planet bisects the angle created by two other planets and the sun. I shall explain more in detail what this means as I go on.

There are four kinds of angular bisection possible. I shall explain each in turn.

Case I

To explain the first kind of angular

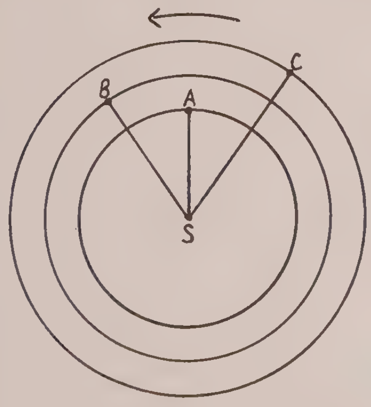


FIG. 1

A SIMPLE INTERIOR BISECTION BY A FAST PLANET.

THE LETTER S. REPRESENTS THE SUN. THE LETTERS A, B, AND C REPRESENTS PLANETS. A IS A FAST MOVING PLANET; B A MEDIUM MOVING PLANET; C A SLOW MOVING PLANET. THE CIRCLES REPRESENT THE ORBITS OF THE PLANETS. AT THE INSTANT BEING DIAGRAMED PLANET A BISECTS (CUTS IN HALF) THE ANGLE CREATED BY PLANETS B AND C AND THE SUN. IN OTHER WORDS, ANGLE CSA EQUALS ANGLE ASB.

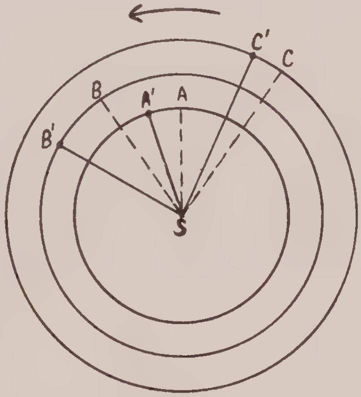


FIG. 2

AN INTERIOR BISECTION CYCLE (CASE 1).

The broken lines represent the situation shown in Fig. 1. The solid lines and the letters A' B' and C' represent the situation after a complete counter-clockwise revolution of planet A and enough more motion so that planet A will bisect the new angle created by the new positions B' and C'.

The time required for A to make the complete circuit and continue to A' is the length of the bisection cycle.

bisection and to make it simple for you, let's imagine that there are only three planets and that these planets go around the sun in circles with the sun at the center. Suppose that two of these planets, B and C, are slow movers and that one, planet A, goes around fast. Let's imagine ourselves looking down upon the solar system and that the planets are placed as in Fig. 1. In this figure, A is so placed relative to B and to C that A is exactly in the middle, angularly, between B and C. That is, the angle BSC has been bisected by the line SA, so that the angle CSA equals the angle ASB.

Now imagine one complete revolution of planet A. Planet A will be back just where it started from. However, planet B will have moved a little to the left and planet C will have moved a little to the left too. Planet A will have to move to the left also, in order to make another bisection. The second bisection is shown in Fig. 2.

In Fig. 2 we see what things look like after one (plus) revolution of planet A. Planet C has moved from C to C'. Planet B has moved from B to B'. These two planets now make a new angle with the sun, C' S B'. To bisect this angle, planet A will have to be at A' so that angle C'S A' will equal A' S B'. The cycle or the time interval between consecutive bisections of this sort will therefore be the time it takes planet A to go once around the sun plus the time it takes planet A to go from position A to A'

If angle CSB is less than 180° its bisection may be called an *interior* bisection. Note that another sort of bisection is possible as shown in Fig. 3. This may be called an *exterior* bisection. It occurs when the fast moving planet is at A", half way from B to C measured counterclockwise.

The time intervals between consecutive bisections will of course vary in accordance with the speed of the planets involved. Each set of these planets will create

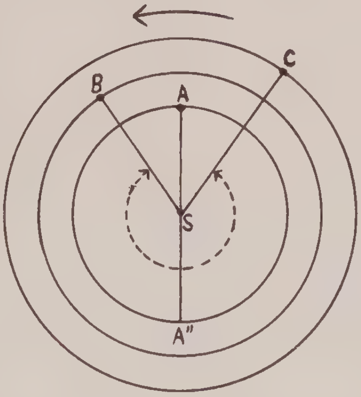


FIG. 3

INTERIOR AND EXTERIOR BISECTIONS (CASE 2).

Planets B and C are less than 180° apart. When planet A is halfway from C to B measured counter-clockwise we have the interior bisection shown in Fig. 1. When planet A is halfway from B to C measured counter-clockwise (see broken line) you have an exterior bisection, as at A". That is, angles BSA" equals A"SC.

If you count interior *and* exterior bisections you get two bisections for every revolution of A.

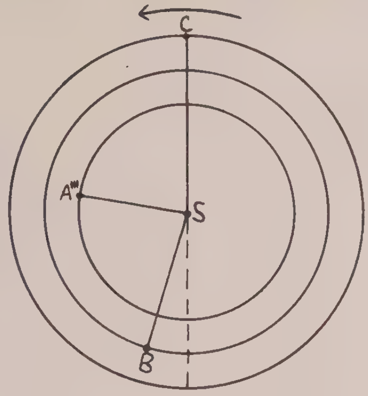


FIG. 4

AN INTERIOR BISECTION JUST BEFORE PLANETS C AND B MAKE A STRAIGHT ANGLE (180°).

A''' IS OF COURSE THE BISECTING PLANET. ANGLE CSA''' EQUALS ANGLE $A'''SB$.

bisections at particular intervals and thus create a situation which will repeat periodically. There periodic intervals are given as Col. 1 of Table 1.

These intervals apply *either* to internal *or* to external bisections.

You should notice something peculiar about bisections of *either* the interior or exterior sort. To make it easy to see what this something is, imagine planets B and C almost opposite each other, as in Fig. 4. Suppose it is 164° from C to B, 196° from B to C. (All measurements counterclockwise). Imagine C and B moving very slowly. Planet A will effect an interior bisection when it is at the location A''' as indicated in Fig. 4. Location A''' is one half of 164° or 82° past C. Planet A will effect another interior bisection a little over one revolution later.

Now suppose planets C and B get nearer and nearer to 180° apart. The bisection occurs nearer and nearer to 90° past C. Finally planets C and B *pass* the 180° relationship, as shown in Fig. 5. Instantly the *interior* bisection takes place at A'''' just half a cycle out of step with what it had been previously! The *external* bisections will behave similarly.

That is, all the cycles shown in Case I reverse phase suddenly and without warning whenever the two slower moving planets involved pass the 180° relationship with each other.

Case II

If you fail to make any distinction between internal and external bisections you will get cycles just half the wave length shown for Case I These cycle lengths are given in Col. II Table 1.

Case III

Now let us now consider a third sort of bisection. Suppose planet A has made its interior bisection of the angle of planets C and B. Suppose it has passed planet B and gone on as far past planet B as planet

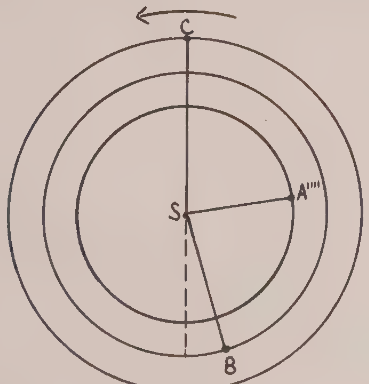


FIG. 5

AN INTERIOR BISECTION JUST AFTER PLANETS C AND B HAVE MADE A STRAIGHT ANGLE (180°).

ANGLE CSA'''' EQUALS ANGLE $A''''SB$. NOTE THAT A'''' IS A WHOLE HALF ORBIT LATER THAN IT WAS IN FIG. 4.

IN OTHER WORDS INTERIOR (AND EXTERIOR) BISECTION CYCLES REVERSE PHASE EACH TIME THE PLANETS, WHOSE ANGLES ARE BEING BISECTED, PASS THE 180° MARK.

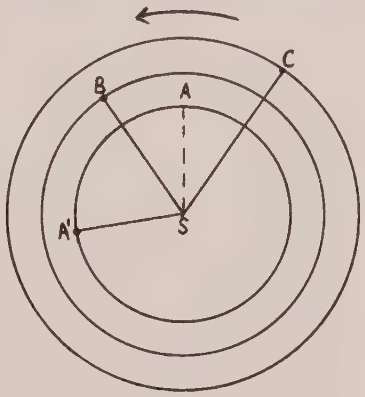


FIG. 6

BISECTION BY A MEDIUM SPEED PLANET. (CASE 3).

A, B, AND C ARE LOCATED AS IN FIG. 1.

NOTE HOWEVER THAT WHEN FAST MOVING PLANET A GETS TO A , AS FAR TO THE LEFT OF B AS B IS LEFT OF C, WE HAVE ANOTHER BISECTION. ANGLE CSB EQUALS ANGLE BSA'. THIS TIME IT IS THE PLANET B WHICH DOES THE BISECTING.

B is past planet C. Under these circumstances we have another bisection with planet B doing the bisecting. This sort of behavior is illustrated in Fig. 6 and the cycle lengths are given in Col. III of Table 1. In this situation angle CSB equals angle BSA.

Case IV

The fourth sort of bisection will occur when planet A continues on around and gets as near to planet C as planet C is to planet B. This sort of behavior is illustrated in Fig. 7. Cycle lengths of bisections of this sort are listed in Col. IV of Table 1. In this situation angle ASC equals angle CSB.

Two or three further facts need to be called to your attention at this point.

First of all, the planets do not revolve around the sun in circles. They revolve in elipses. The result of this fact is that sometimes the planets go faster, sometimes slower. The cycle lengths given are therefore merely *average* lengths. Any particular cyclic wave might be a bit longer or a bit shorter.

It should be noted that in radio weather the cycles listed in Columns I and II are not always operative. Certain enabling conditions need to be met. However, this need not concern us here. It is really the subject of another article. It has no effect upon the cycle length. It merely means that in radio weather sometimes the cycle is operative, sometimes it isn't. (See the article in the October 1955 report.)

All the cycle lengths given are known to have, under certain circumstances, their counterparts here on earth. So far these counterparts have been found only in radio weather. The next step is to see if cycles of these lengths are operative in other things too.

Happy hunting! E.R.D.

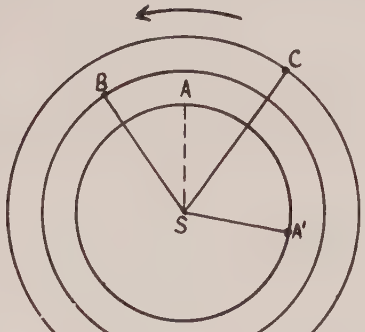


FIG. 7

BISECTION BY A SLOW SPEED PLANET. (CASE 4)

A, B, AND C ARE LOCATED AS IN FIG. 1.

AS FAST MOVING PLANET A MOVES COUNTER-CLOCKWISE IT WILL EVENTUALLY COME AS CLOSE TO PLANET C AS PLANET C IS TO PLANET B. ANGLES A'SC WILL BE EQUAL TO ANGLE BSC.

HERE WE HAVE A THIRD KIND OF BISECTION WITH SLOW MOVING PLANET C DOING THE BISECTING.

Table 1

	Case I	Case II	Case III	Case IV
MERCURY –				
Venus:				
Earth	.352	1.760		
Mars	.325	1.625		
Jupiter	.303	1.515		
Saturn	.301	1.505		
Uranus	.300	1.500		
Neptune	.299	1.495		
Pluto	.299	1.495		
Earth:				
Mars	.295	1.475		
Jupiter	.277	1.385		
Saturn	.275	1.375		
Uranus	.275	1.375		
Neptune	.274	1.370		
Pluto	.274	1.370		
Mars:				
Jupiter	.260	1.300		
Saturn	.259	1.295		
Uranus	.258	1.290		
Neptune	.257	1.285		
Pluto	.257	1.285		
Jupiter:				
Saturn	.244	1.220		
Uranus	.244	1.220		
Neptune	.243	1.215		
Pluto	.243	1.215		
Saturn:				
Uranus	.243	1.215		
Neptune	.242	1.210		
Pluto	.242	1.210		
Uranus:				
Neptune	.241	1.205		
Pluto	.241	1.205		
Neptune:				
Pluto	.241	1.205		
VENUS –				
Earth:				
Mars	1.163	5.815	6.33	.640
Jupiter	.924	4.620	3.44	.407
Saturn	.903	4.515	2.94	.391
Uranus	.895	4.475	2.75	.386
Neptune	.892	4.460	2.70	.383
Pluto	.890	4.450	2.69	.382
Mars:				
Jupiter	.759	3.795	1.546	.503
Saturn	.745	3.725	1.678	.478
Uranus	.739	3.695	1.745	.469
Neptune	.738	3.690	1.761	.467
Pluto	.737	3.685	1.770	.465
Jupiter:				
Saturn	.638	3.190	.671	.609
Uranus	.634	3.170	.681	.593
Neptune	.633	3.165	.684	.590
Pluto	.633	3.165	.684	.588
Saturn:				
Uranus	.624	3.120	.637	.612
Neptune	.623	3.115	.640	.608
Pluto	.623	3.115	.641	.606
VENUS –				
Uranus:				
Neptune	.619	3.095	.623	.616
Pluto	.619	3.095	.623	.614
Neptune:				
Pluto	.618	3.090	.618	.616
EARTH –				
Mars:				
Jupiter	1.445	7.225	45.5	.733
Saturn	1.395	6.975	33.3	.683
Uranus	1.374	6.870	19.2	.663
Neptune	1.368	6.840	17.8	.658
Pluto	1.366	6.830	16.7	.656
Jupiter:				
Saturn	1.063	5.315	1.156	.984
Uranus	1.050	5.250	1.186	.943
Neptune	1.047	5.235	1.193	.933
Pluto	1.046	5.230	1.196	.929
Saturn:				
Uranus	1.024	5.120	1.059	.990
Neptune	1.020	5.100	1.066	.978
Pluto	1.019	5.095	1.068	.975
Uranus:				
Neptune	1.009	5.045	1.017	1.000
Pluto	1.008	5.040	1.024	.996
Neptune:				
Pluto	1.005	5.025	1.008	1.002
MARS –				
Jupiter:				
Saturn	2.11	1.055	2.52	1.825
Uranus	2.07	1.035	2.67	1.689
Neptune	2.06	1.030	2.71	1.658
Pluto	2.05	1.025	2.72	1.645
Saturn:				
Uranus	1.96	.980	2.10	1.845
Neptune	1.95	.975	2.13	1.808
Pluto	1.94	.970	2.14	1.792
Uranus:				
Neptune	1.92	.960	1.946	1.883
Pluto	1.91	.955	1.953	1.866
Neptune:				
Pluto	1.90	.950	1.908	1.887
JUPITER –				
Saturn:				
Uranus	16.2	.810	35.2	10.59
Neptune	15.6	.780	44.6	9.43
Pluto	15.3	.765	48.8	9.07
Uranus:				
Neptune	13.3	.665	15.0	11.9
Pluto	13.1	.655	15.5	11.3
Neptune:				
Pluto	12.6	.630	13.1	12.2
SATURN –				
Uranus:				
Neptune	40.2	2.010	61.3	29.7
Pluto	38.5	1.925	70.9	26.5
Neptune:				
Pluto	34.6	1.730	38.6	31.3
URANUS –				
Neptune:				
Pluto	147.0	7.350	256	101

ALL COMPUTATIONS MADE FOR J. H. NELSON BY ALAR TOOMRE

EXPLANATION OF THE TABLE

Col. I gives you the average time intervals in years between bisections when, as the result of a single revolution, a line from a faster planet and the sun will bisect the angle created by lines between each of two slower moving planets and the sun. Thus the first figure of .352 means that every .352 years fast moving Mercury will bisect the angular relationship between Venus and Earth.

Some of these bisections will be interior bisections, some exterior bisections. (An interior bisection is one where the angle being bisected is less than 180°; an exterior bisection is one where the angle being bisected is over 180°.)

In these bisections sometimes one of the two slower moving planets will lead, sometimes the other.

Obviously, when the angles of very slow moving planets are being bisected the time interval of the cycle is close to the sidereal period of the fast moving planets

Col. II values are exactly half of the values in Col. I and represent the time intervals between consecutive bisections of the sort listed in Col. I if you count two bisections (one interior, one exterior) for each revolution of the fast planet.

Col. III values represent the time intervals between consecutive bisections when the bisection is effected by the planet of middle speed. Thus the first value of 6.33 in this column means that every 6.33 years the Earth will bisect Venus and Mars.

These bisections may be either interior or exterior.

These bisections may occur when either the fast or the slow planet is leading.

Col. IV values represent the time intervals between consecutive bisections when the bisecting is effected by the slowest of the three planets involved. Thus the first value of .640 in this column means that every .640 year Mars will bisect Venus and Earth.

As in Col. III these bisections may be either interior or exterior. They may occur when either of the other two planets is leading.

No Col. III or Col. IV bisection cycles were computed for Mercury because of the amount of work entailed.

Bear in mind that all cycle lengths are *average* planetary orbital movements.

The planets, in relative average orbital speed, from fastest to slowest, are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto.

THE 3.49-YEAR CYCLE IN CORN PRICES

IN an article called the "The 3 1/2- to 3 3/4-Year Cycles in Corn Prices, 1720-1954," printed last month, I told you that the two chief cycles in corn prices of this general order of magnitude were about 3 2/3 and about 3 1/2 years long respectively. This article will tell you more about the shorter of these two cycles.

For the benefit of those persons who do not have October's report I should say that that article contained a chart showing (a) monthly corn prices, January 1720-December 1954 (b) trend, and (c) the percentages by which the monthly corn prices were above or below trend. It also showed semi-annual averages of these percentages, printed herewith as Fig. 1 and a three 7 1/3-half-year (3 2/3-year) section moving average[1] of these values, printed herewith as Fig. 2.

Fig. 2 shows a cycle of variable length. However, from about 1860 to date, this length has been about 3 1/2 years and quite regular.

Questions

Last month's article asked the following questions about this 3 1/2-year cycle:

1. What is its exact length?
2. Is its length perfectly regular, or, when we put it under the microscope, does its length change?
3. If its length changes, is there anything orderly about the way it does it?
4. What is its exact timing, and where are we in the cycle now?
5. What profit would you have made if you had traded on this cycle for the last 95 years? And how consistent would your profits have been?
6. Was the 3 1/2-year cycle present as a *hidden* cycle prior to 1860, or did it start suddenly at that time?

To get the best possible picture of the so called 3 1/2-year cycle we must manipulate the figures in such a way as to eliminate the 3 2/3-year cycle. This is very easy. All we have to do is to chop the figures into sections 3 1/2 years long and average enough of these sections so that the 3 2/3-year cycle will 'wash out."[2] For our purpose it will be best to take 22 sections[3]. We therefore take the percentages above and below trend shown in Fig. 1, average[4] each overlapping group of 22 cycles,[5] and plot the results in Fig. 3.

Facts About the 3.49-Year Cycle

A study of this curve, which minimizes random and leaves the so called 3 1/2-year cycle in as nearly pure form as you can get it, shows a number of things:

First, the cycle was present on the average in each 22 three-and-a-half-year section, i.e., in each overlapping group of 77 years, from the *beginning* of the series. We may conclude that during the first hundred years it was overwhelmed by the 3 2/3-year cycle, but that it was present.

Second, as nearly as can be measured by these methods the length of the cycle is 3.49 years.[6]

Third, there is considerable variation in strength, the cycle at times being twice as strong as at other times. This fact suggests that there may be other regular cyclic forces of closely related wave lengths operating in this series. (Of course this variation *might* be the result of some particularly strong randoms. It would take some study to have an opinion, one way or the other.)

Fourth, if the length is 3.49 years, the

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[1] FOOTNOTES REFER TO ADDITIONAL INFORMATION, OF INTEREST ONLY TO THE TECHNICIAN, AVAILABLE AT THE END OF THE ARTICLE.

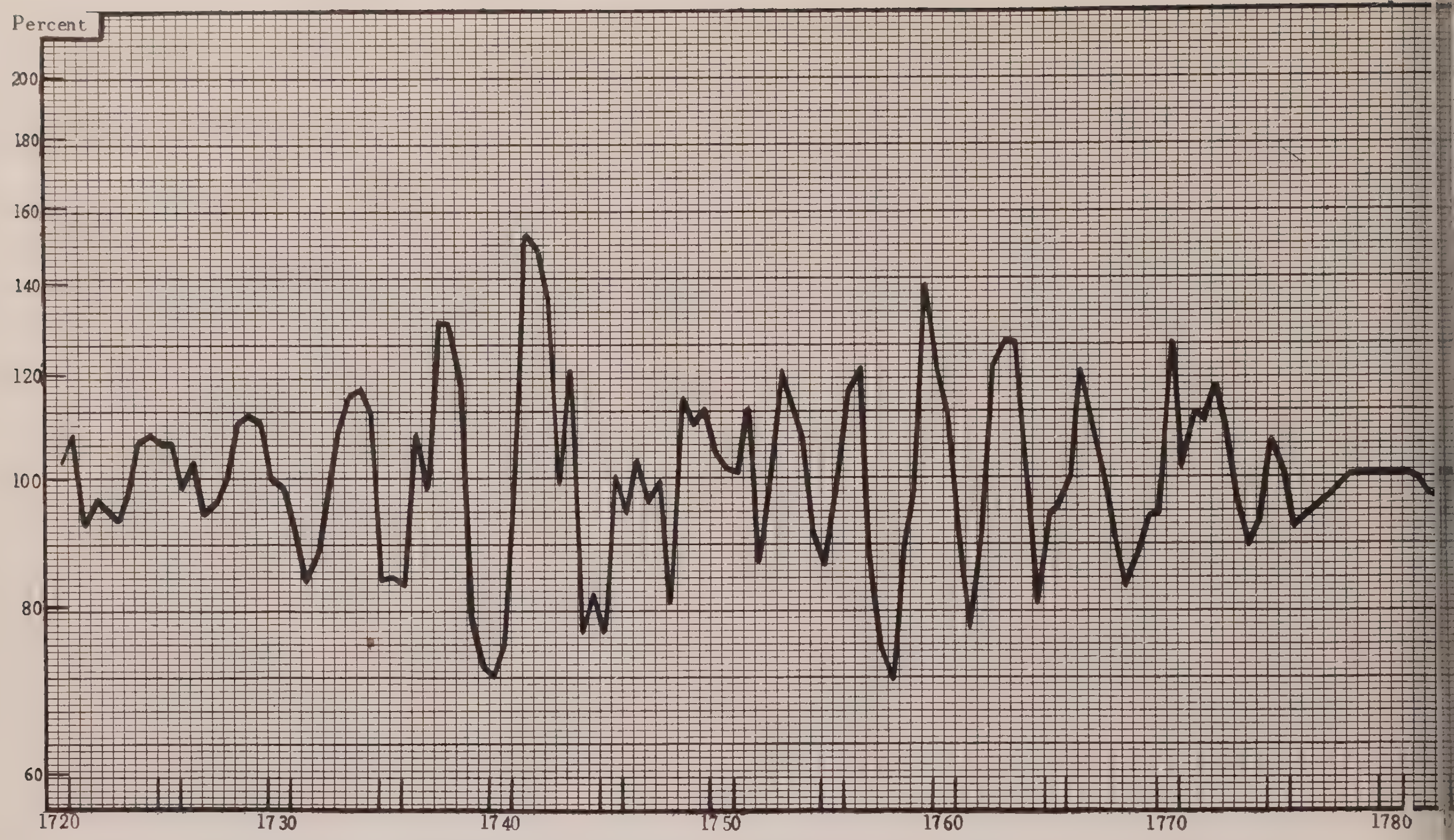


Fig. 1. Corn Prices, 1720-1954. Semi-annual average prices, expressed as percentages of trend. (A chart of the raw data—actual monthly prices, January 1920-December

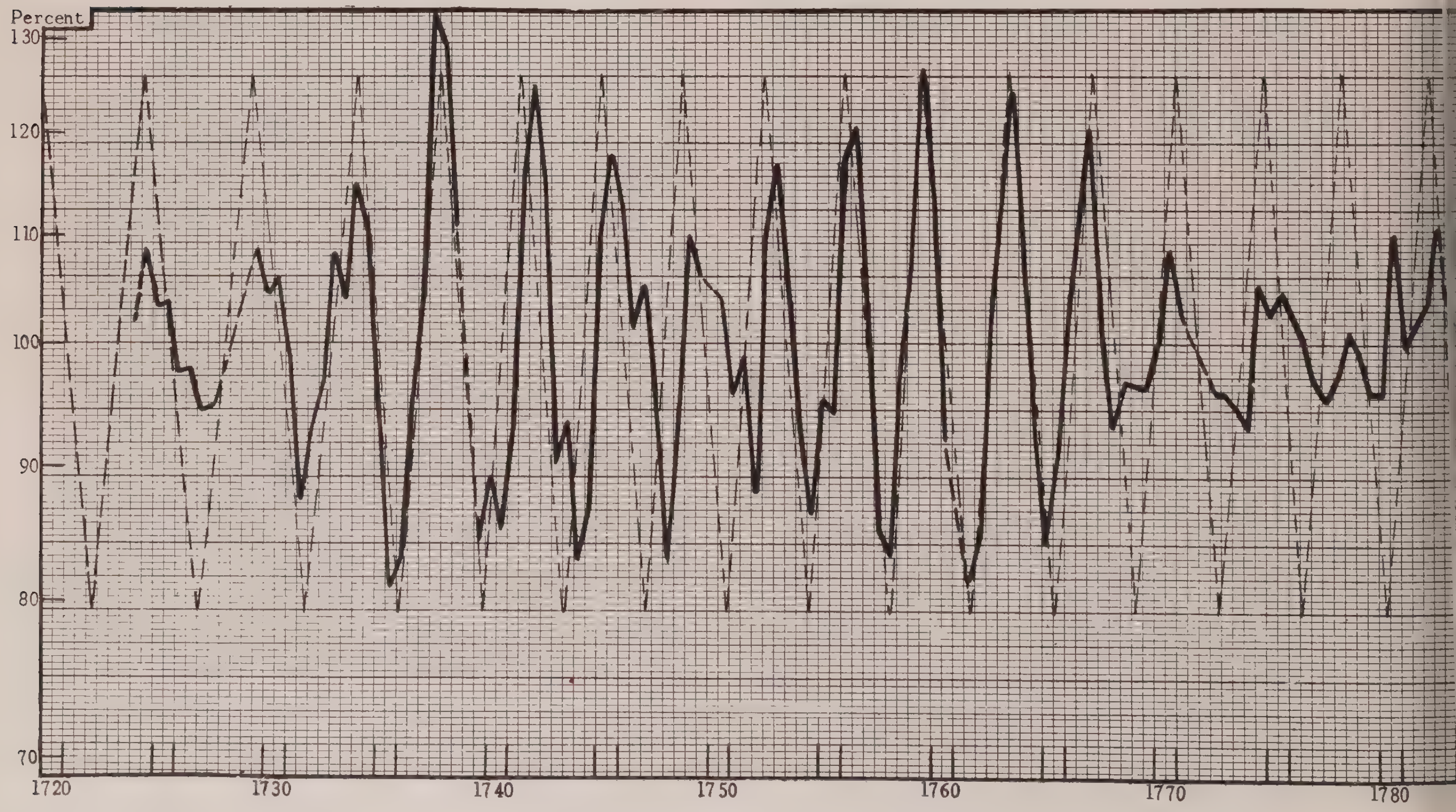
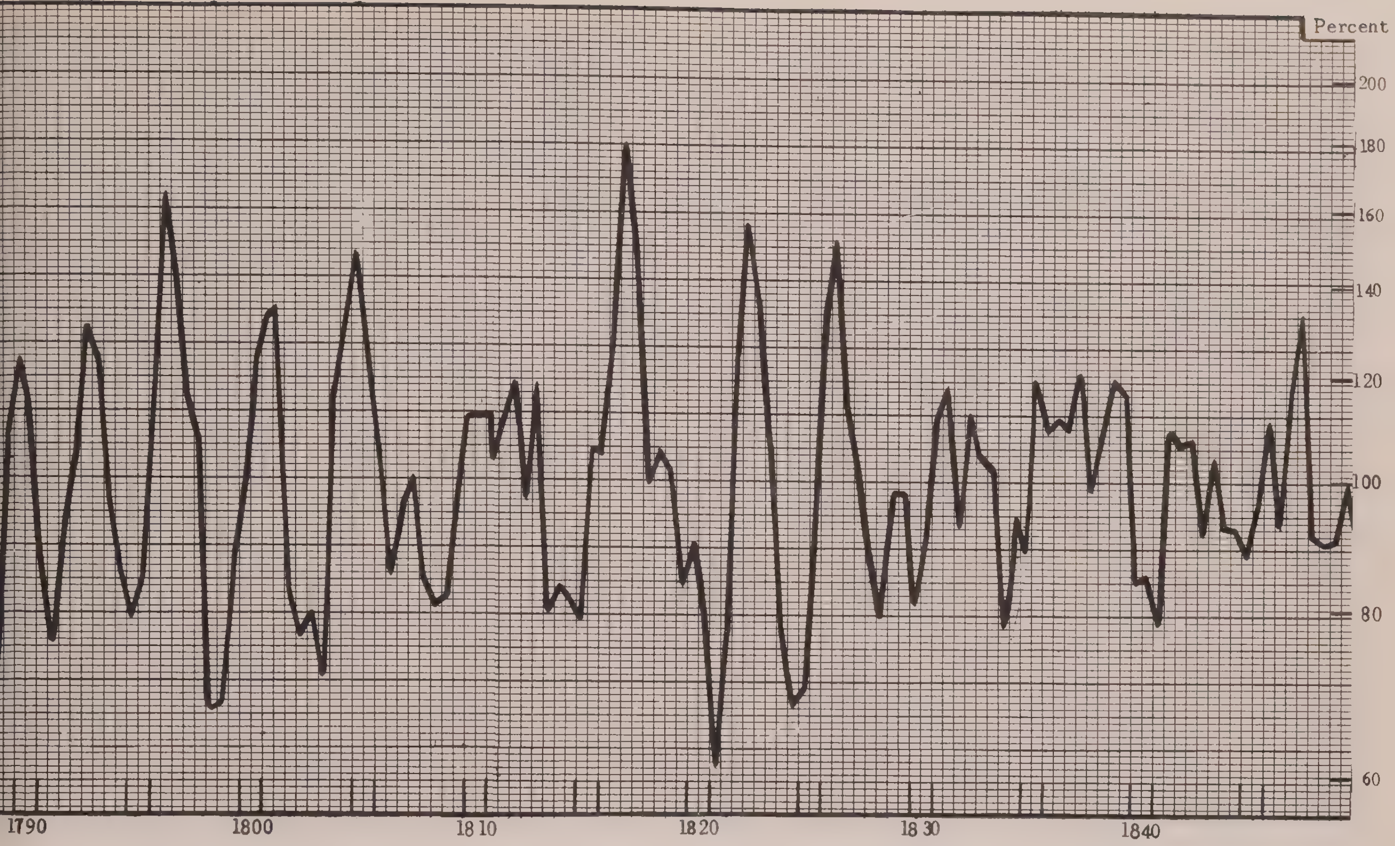
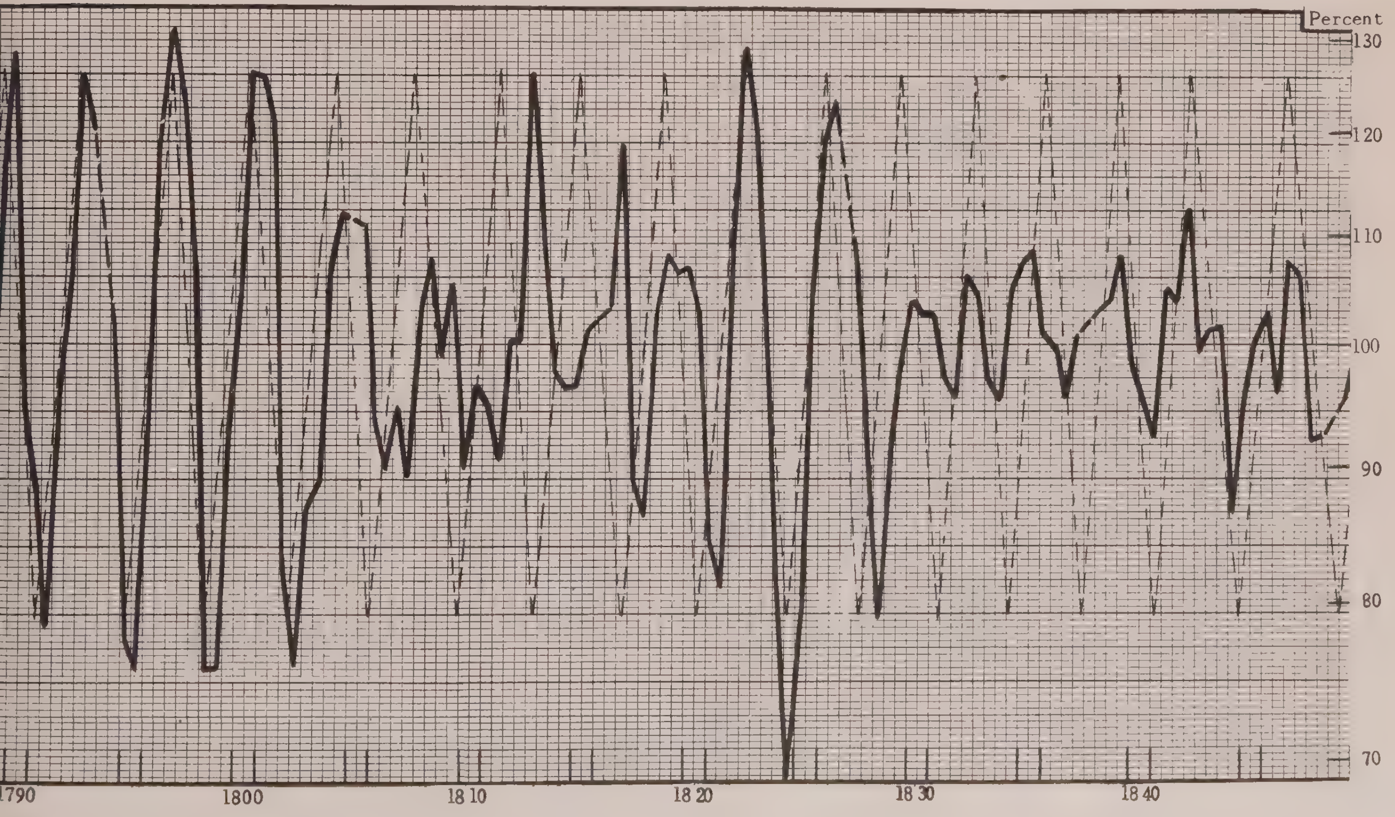


Fig. 2. The values in Fig. 1 filtered to show cycles in the 3 1/2- to 3 2/3-year range. Randoms and longer cycles have been minimized. For an explanation of the method of filtering see the text. A cycle of variable length is disclosed. This



1954, not adjusted for trend---was printed in our report for October, 1955). Semi-annual averages are for crop years, November to April and May to October respectively.



cycle is diagrammed by the broken zigzag line. From 1860 to date, this cycle has been very close to 3 1/2 years long and quite regular in length even though the amplitude varies considerably from time to time.

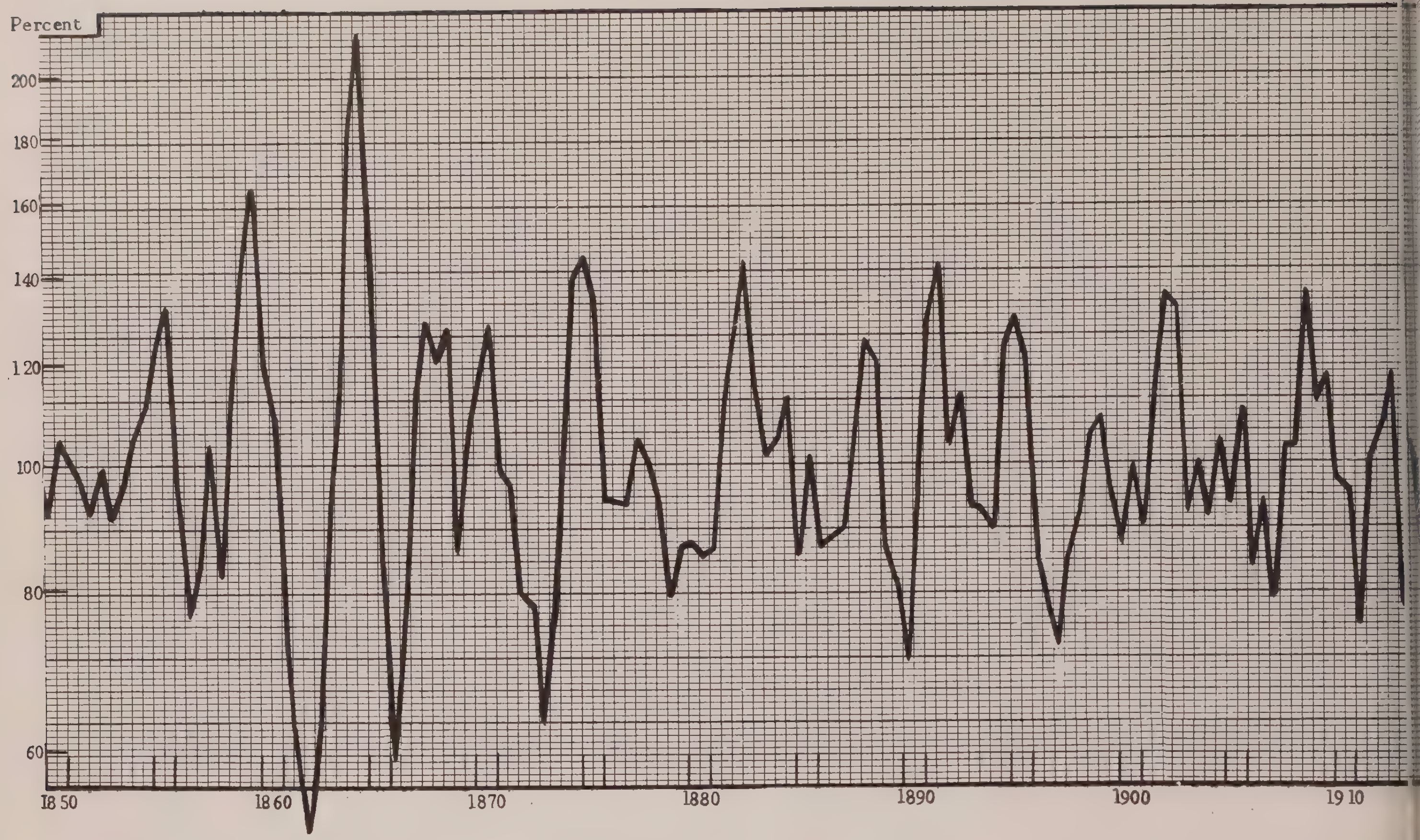


Fig. 1. Continued.

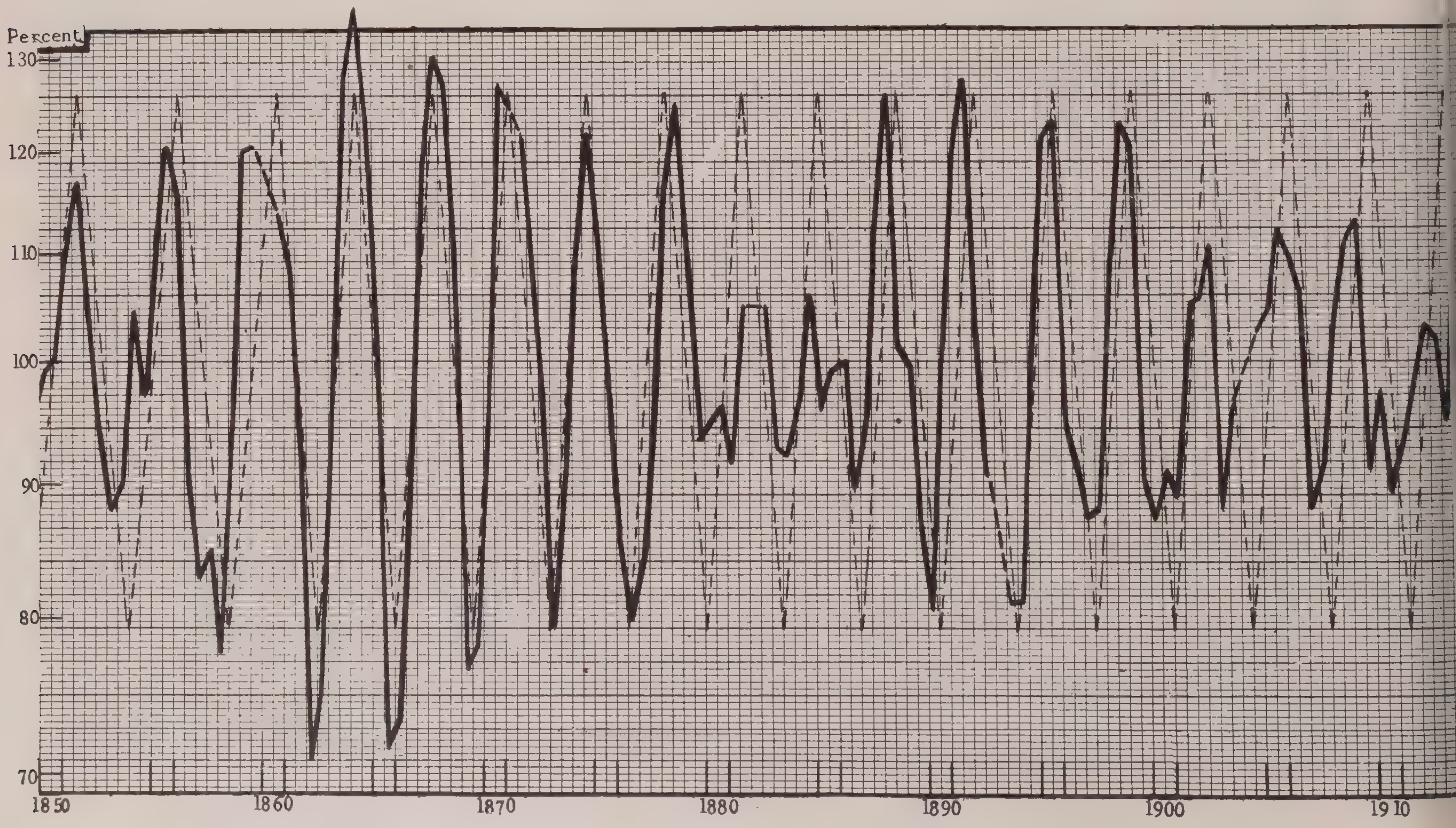
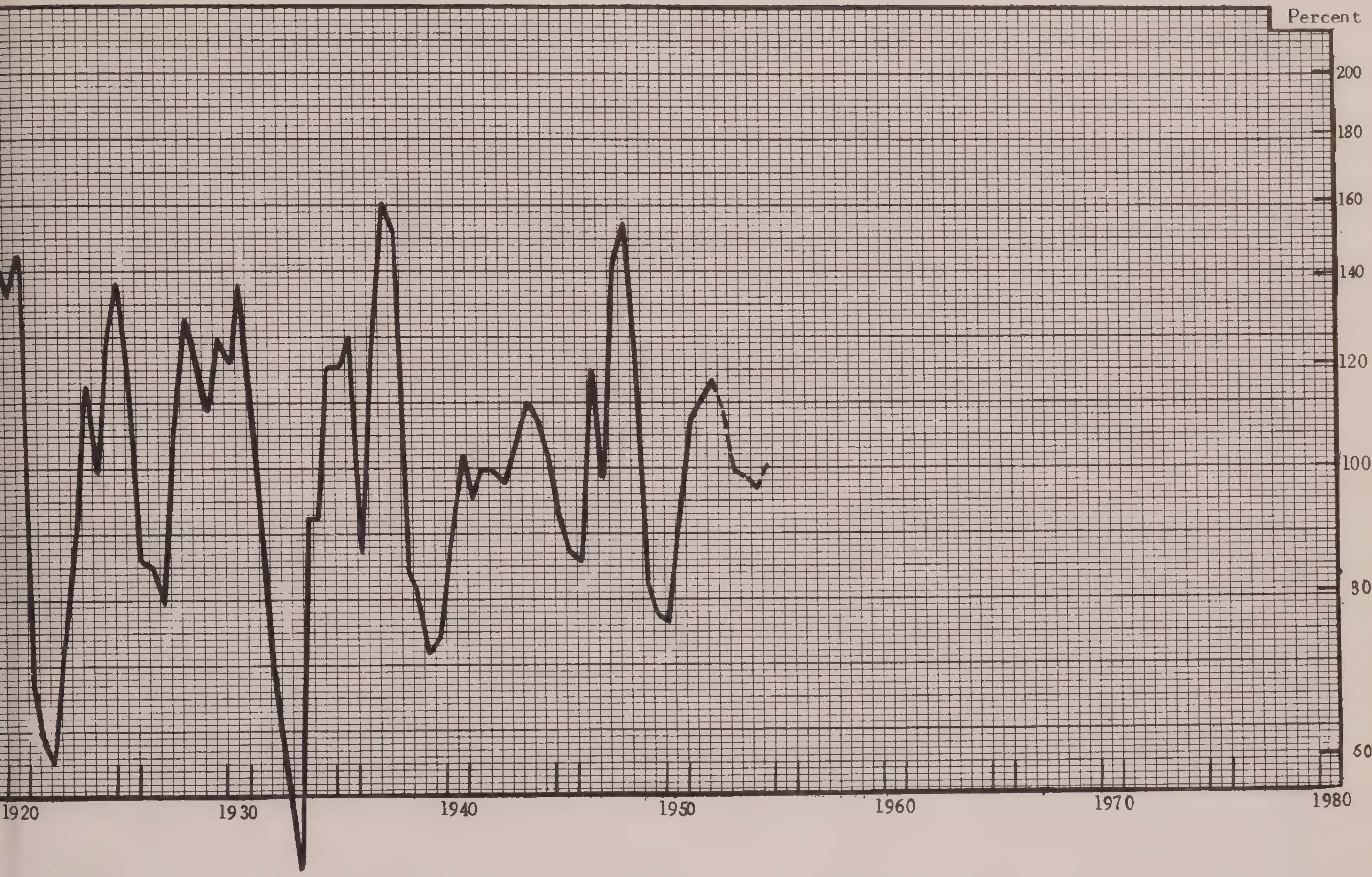
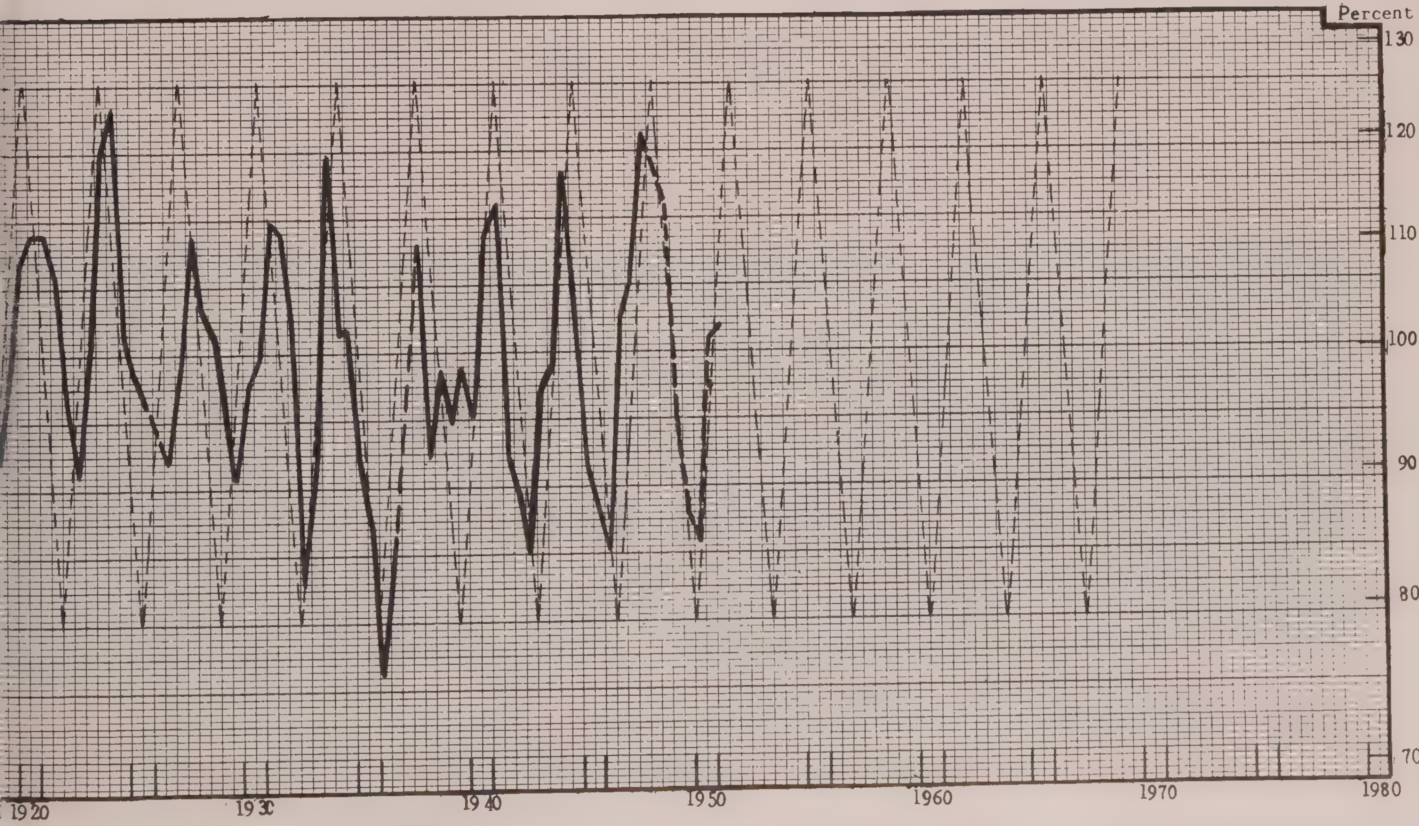


Fig. 2. Continued.


Percent
200
180
160
140
120
100
80
60
1920
1930
1940
1950
1960
1970
1980


Percent
130
120
110
100
90
80
70
1920
1930
1940
1950
1960
1970
1980

ideal date of the current crest of this cycle is end of crop year 1953-54.[7] It is now on its way down.

Fifth, the average strength of the cycle is 106.6% of trend at half-year of crest, 93.4% of trend at half-year of trough.

Sixth, the net profit which would have resulted from trading on this cycle, using actual monthly prices 1720 to date, would have been 1077% over the entire span of 235 years, or 4.6% a year.

This work is accurate as far as it goes, but I warn you not to try to use it for trading purposes. It is too crude. First of all, it uses only semi-annual values. For accurate work *monthly* values must be used. Second, there are other cycles (and randoms) which must be taken into account also.

Not a Forecast

This article is not intended as a *forecast* of corn prices. It is a study of *one* of the cycles which should be taken into account if *you* wish to make a fore-

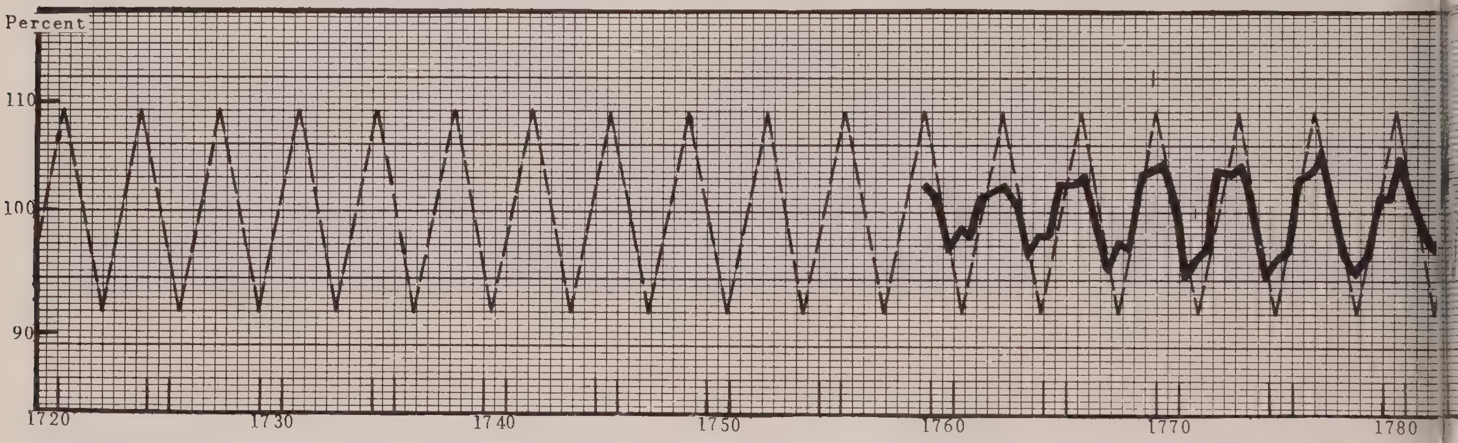


Fig. 3. The values of Fig. 1 filtered further to minimize any 3 2/3-year cycle and randoms and to leave the 3 1/2-year cycle relatively undistorted. You can see that

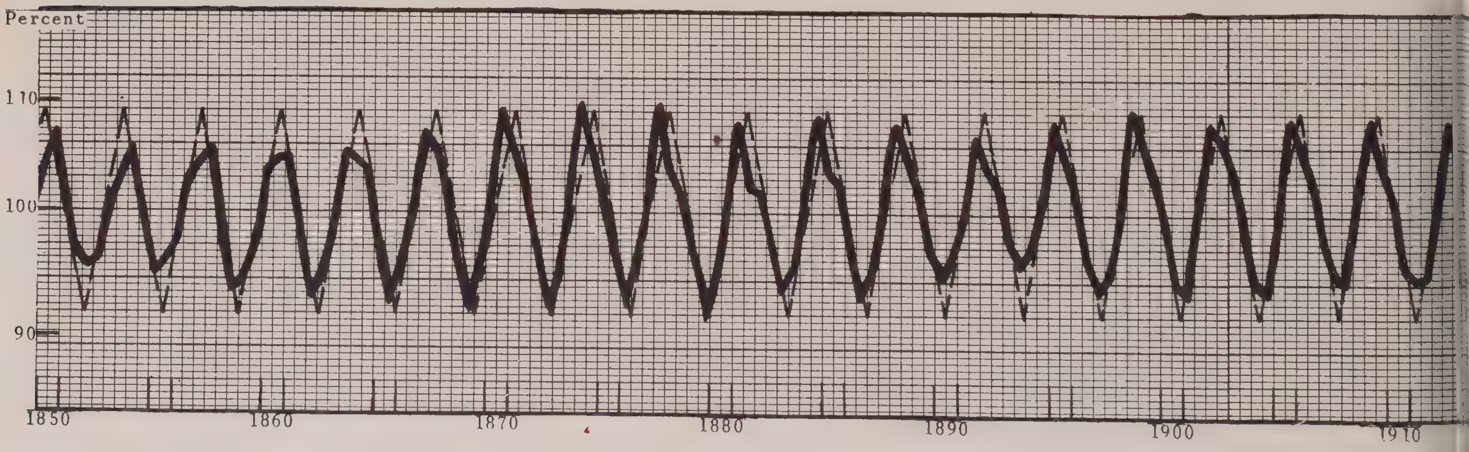


Fig. 3. Continued.

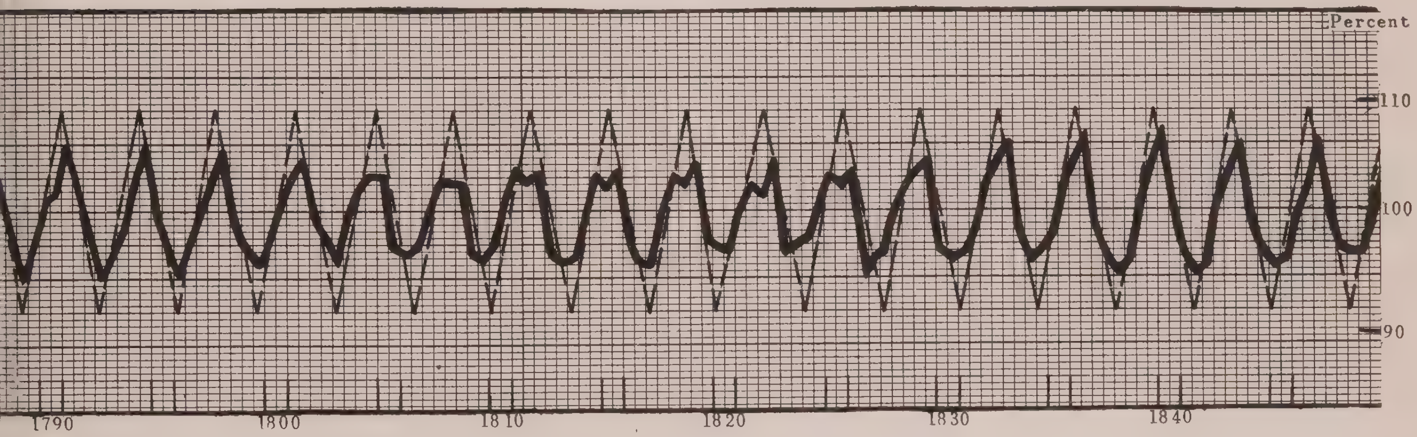
cast of corn prices.

What this article does do is to report upon a piece of basic research which ties down the well known 3 1/2-year (42-month) cycle better than has been done hitherto. It shows that this cycle has been present as a *rhythm* in corn prices for over 95 years and that even before that it was present on the average.

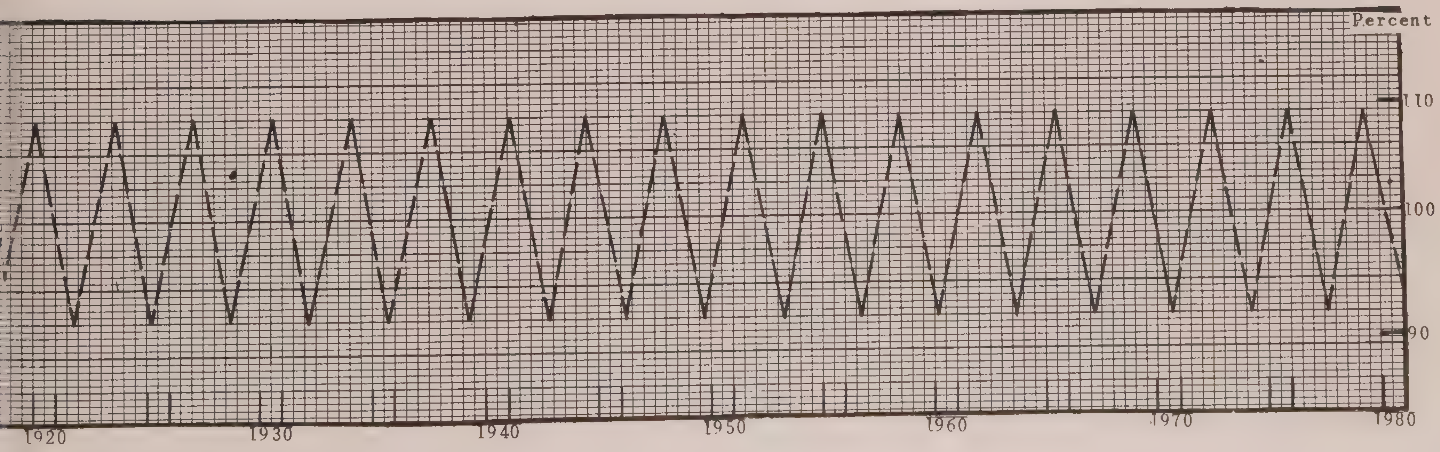
On the other hand, the varying strength of this cycle must be explained before we know all there is to know about this cycle in these figures. E.R.D.

TECHNICAL

1. A section moving average, sometimes called a moving cycle, merely averages two or more consecutive overlapping sections of the indicated length. For example, if you were making a three 12-month section moving average of a series of monthly figures starting in January 1900 you would average January of 1900, January of 1901 and January of 1902, plotting this average as the value of January 1901. Then you would average January 1901, January 1902, and January



the 3 1/2-year cycle was present as a hidden component prior to 1860 as well as a visible cycle, 1860 to date.



1903 to get an average to be plotted as January of 1902, and so on for all your Januarys and for all your other months. This process would clarify your 12-month cycle by minimizing randoms and other cycles.

When used in connection with a 12-month cycle this technique is known as a moving seasonal. However it can be applied to cycles of any length.

2. The more sections you include in your section moving average the more sharply the cycle is revealed. For example, speaking roughly, a *two* 3 1/2-year section moving average will filter out 5 1/4- and 2 1/3-year cycles, a *three* 3 1/2-year section moving average will filter out 4 2/3- and 2.6-year cycles. A *ten* 3 1/2-year section will filter out 3.85- and 3.15-year cycles, etc.

3. A twenty-two 3 1/2-year section moving average will filter out cycles as close to 3 1/2 years as 3.34 years and 3.66 years.

4. As logs of data were used throughout, the result of the averaging is a geometric average of the deviations of the data. Randoms were further minimized by limiting the deviations to 2.000 ± .100.

5. Each cycle is 7 half-years or 3 1/2 years long.

6. The average of the forty-four 3 1/2-year cycles crests 3.70 years after base. Because we have to deal with crop years (Nov.--Oct.), base is end of Jan., 1794, i.e. 1794.083. The average of the last forty-four year cycles crests 3.45 years after its base 1871.083. This slippage of .25 years in 22 cycles is .011 years per cycle. Three and a half years less .011 years is 3.49 years, the length of the cycle. (Actually 3.4886 years.)

7. More exactly, 1954.98, but of course this accuracy is specious.

A SEASONAL CYCLE OF RAINFALL

By Saville R. Davis
American News Editor of
The Christian Science Monitor

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THE weather, according to the latest public-opinion poll by Elmo Gallup Associates, is 10 times more popular than any other subject discussed by the American people.

More nonsense is talked about the weather than about any other topic.

This story, then, must be the biggest nonsense of all.

It couldn't possibly be true.

Well, anyhow, it probably isn't true.

Or is it?

The man in the witness chair is Dr. E. G. Bowen. He is not a meteorologist, which means that he has the objectivity of more or less ignorance about the weather. He became interested in what is hopefully called "rainmaking," and he found out some things.

In case you are interested, Dr. Bowen is also a physicist with one of the ranking international reputations in quite another field. Wherever anyone knows about microwaves he knows about Dr. Bowen, who more or less discovered them. So the story about to be unfolded comes from a man who knows something about facts and research and how to draw conclusions from evidence and other such—from the viewpoint of this story about the impossible—nonsense.

Standard Theories Tremble

Dr. Bowen is prepared to tell you precisely when to look for the next series of really heavy rain or snow storms to visit planet earth.

He won't tell you where they will hit, because that depends on the weather pattern when they come; they will fall wherever there are clouds ready to yield them, on approximately the dates he will name.

He is willing to tell you what causes these storms.

He will tell you when all the other big visitations of rain or snow will arrive this year. And next year. And from there on out for quite a millennial while.

And if that is not enough he will offer some facts to suggest that the weather isn't motivated by what you think it is—shifting barometric pressures and temperatures.

Finally, he might even suggest why long cyclical changes in the weather might take place, such as bring and disperse ice caps.

The effect of all this on conversation is clearly limitless. You might, for example, plan appropriate comments on the world weather pattern with which you could greet a friend on Jan. 12, 1973, if you like.

But let's tell the story as it happened.

In the late summer of last year (wait a moment, in August it is winter in Australia) Dr. Bowen was working in the Australian Government's radio astronomy laboratory in Sydney, of which he is director. One of his duties is to investigate the whole problem of natural and artificial rainfall. And as part of this study he looked back into the rainfall figures for Sydney.

He noticed that exceptionally heavy falls of rain—real downpours—recurred always on certain dates at random intervals of every six to eight years or so. For example, in January there was a really heavy fall every six to eight years on the

12th or 13th. Also on the 22d or 23d. Also around the 31st or Feb. 1.

And on some 18 or 20 other fixed dates throughout the year.

So Dr. Bowen took a good long period—1902 to 1944—and made a chart showing the total rainfall for Sydney on each calendar day of January. The same peaks showed up like mountains in a range very clearly on the same days. They were made up not of yearly rain but of a really big downfall every so many years, which swelled the totals for those particular dates.

Intercontinental Studies

Surely this didn't mean anything. A chart has to go up and down, and maybe it just happened this way.

Maybe.

Dr. Bowen went back to the previous 50-year period in the past century. Same peaks of rain, same dates. They reached points on the chart which were twice as high as the mean for the period. (For the benefit of the trained reader, their departure from the mean was about four times the standard deviation of the remainder.)

He wrote to the New Zealand weather authorities. They sent records from weather stations in Wellington, Auckland, and Christchurch for the first half century.

Same approximate dates, same peaks.

Now it got exciting. How about sample figures from other continents in the Southern Hemisphere—Africa and South America? He wrote to the central weather authorities and to individual stations. Figures in the form he wanted were not readily available and usually had to be taken from the original records. Figures came in from such places as Durban, South Africa, and Santiago, Chile. Fifty-year records.

Same dates, same peaks.

This was very odd. The weather pattern travels around the earth at several hundred miles a day. And you'd expect to see any disturbance follow a slow time path from one continent to another.

It wasn't so.

Though they hit different parts of the earth's surface on different years, these big downfalls were pouring out of the clouds on the same special days of the year, all around the globe.

This didn't look at all like "climate" in the normal sense of the term. It looked to Dr. Bowen like disturbances from outside. "Extraterrestrial," the experts would say.

What about the Northern Hemisphere? The trail led next to Britain, to Kew and Manchester and several other stations.

This was the first disappointment. You might have guessed it. There were no clearly visible peaks. In Britain it just rained buckets and dishpans much of the time.

Dr. Bowen tried again. Were there figures, he asked the British authorities, for just the heavy rainfalls, the big ones? There were. The British weather stations had recorded any fall over 2½ inches since 1919.

Why the Surprise?

Those peaks again. They stood out clear on Jan. 11, Jan. 23, Feb. 1, with an extra peak on Jan. 2 for good measure.

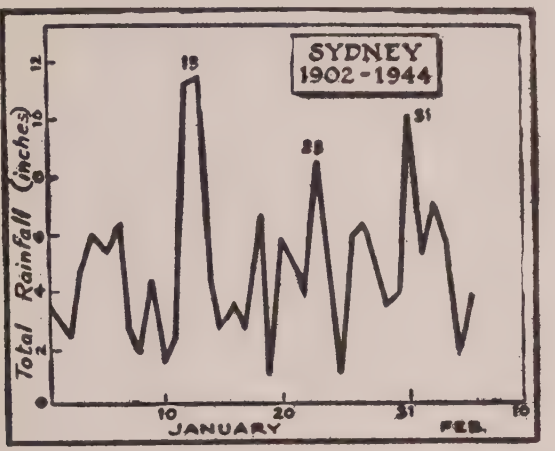
Time out for a minute. This story has been waiting a good many thousands of years to be told, so it can wait a moment more. Why were those peaks a surprise? If they exist so dramatically, why hadn't they been observed long before now?

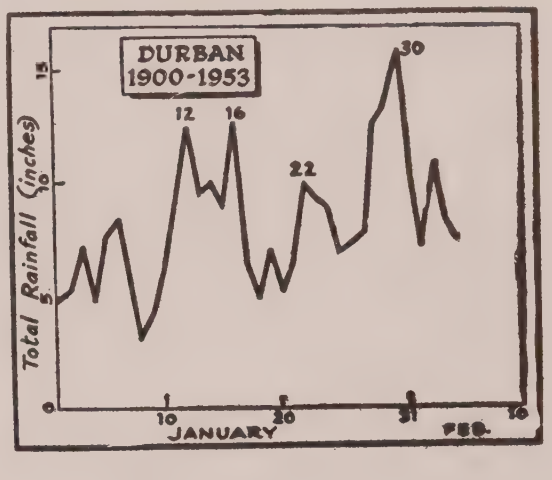
For one thing, they weren't obvious. These heavy rains came only once every so many years in one particular spot on the particular dates. Unless the local farmers remembered them, in their intimate concern with earth and sky, their correlation wouldn't be easy to preceive.

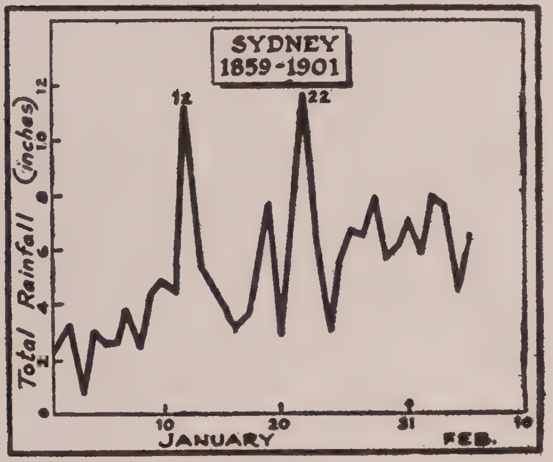
Also, causation in the field of weather isn't reckoned in terms of rainfall. Since the first serious weather study, patterns and weather maps have been based on barometric pressures. Clearing and clouding, rain and snow, are assumed to follow the interaction of low pressure areas and high, hot air masses or cold. Rainfall was derivative, not primary, on the whole. And so it has been given less attention.

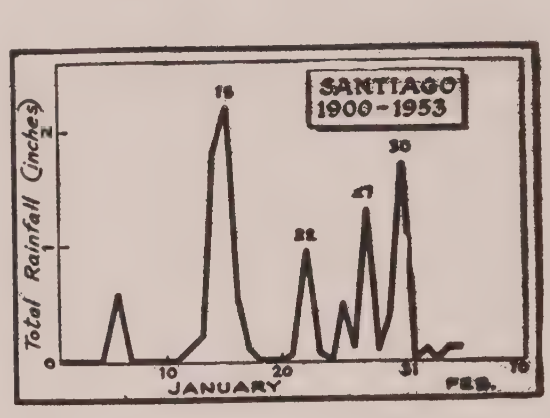
From Kew, Dr. Bowen came to Washington and to the national weather records center at Asheville, N.C. He asked for the rainfall records from individual stations along an east-west line from Denver to Norfolk, Va., and along a north-south line from Duluth, Minn., to New Orleans. For 50 years back.

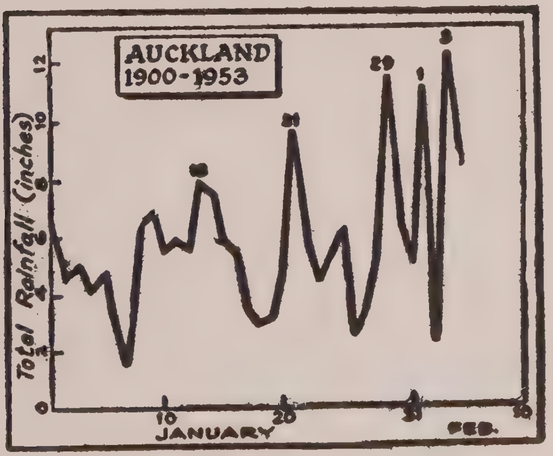
He was expectant, this time, as his old

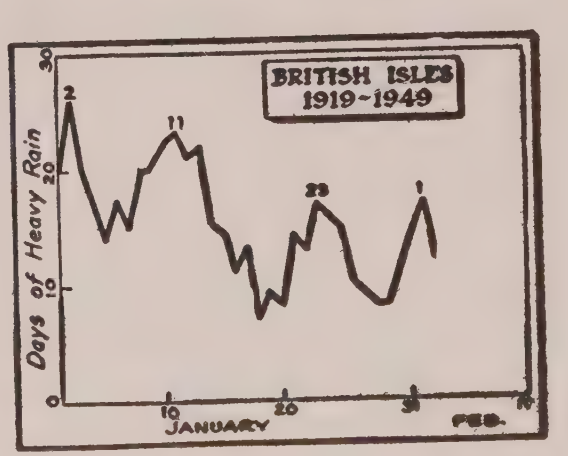

SYDNEY
1902-1944
Total Rainfall (inches)
0
2
4
6
8
10
12
13
23
31
10
20
31
10
JANUARY
FEB.


DURBAN
1900-1953
Total Rainfall (inches)
0
5
10
15
12
16
22
30
10
20
31
10
JANUARY
FEB.


SYDNEY
1859-1901
Total Rainfall (inches)
0
2
4
6
8
10
12
12
22
10
20
31
10
JANUARY
FEB.


SANTIAGO
1900-1953
Total Rainfall (inches)
0
1
2
15
22
27
30
10
20
31
10
JANUARY
FEB.


AUCKLAND
1900-1953
Total Rainfall (inches)
0
2
4
6
8
10
12
13
21
29
1
3
10
20
31
10
JANUARY
FEB.


BRITISH ISLES
1919-1949
Days of Heavy Rain
0
10
20
30
2
11
23
1
10
20
31
10
JANUARY
FEB.

friends appeared on the chart paper one by one. Same dates, same peaks, And perhaps because this was the Northern Hemisphere, the same Jan. 2 extra peak as in Britain turned up for good measure.

Now, what does this mean? Is this another sign of the assorted unities we are discovering on earth? Can we launch a new banner: One World, One Weather? On Jan. 23 are a farmer, a peasant, a kulak, a fellah shiveringly kin?

Why?

Like so many discoveries, Dr. Bowen's answer is simple.

One thing, he reasoned, could be eliminated. These effects cannot be due to any earthbound cause. They are taking place all around the globe in both Southern and Northern Hemispheres on the same dates. The weather just doesn't move that fast.

It must, then, be due to some outside factor which always recurs on the same days of the year. This link to the earth's orbit eliminated such things as sunspots, perturbations of the moon's orbit, conjunctions, and other such effects which have often been examined for their influence on the weather. Their occurrence is not related to the earth's orbit around the sun.

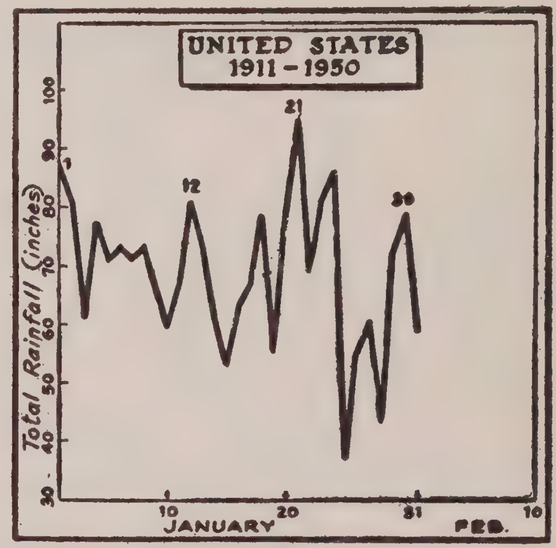
Dust Sprinkles Down

There was only one other possibility that Dr. Bowen could turn up—namely, meteor showers. At the climactic moment in his search which came just after the first figures from the Northern Hemisphere arrived, he assembled the dates when the earth regularly traverses paths of meteor dust, and compared them with his charts. This, he said to himself, was it. The dates fell just 30 days before the observed peaks.

The correlation—and the supporting explanation which leaped to mind—was just too clear and extensive for any coincidence or trick of statistics.

Meteor showers, as it happened, were not in Dr. Bowen's immediate field of specialty. They had nothing to do with radio physics effects.

They are pure inert dust, the remains of the trails of old and expired comets. One is tempted to call them cosmic dust, but that is wrong because they are tied to our own solar system. These particles range from the size of marbles down to the finest dust. They are made up roughly of 60 per cent silicon dioxide (sand to you) and 40 per cent iron oxide (speaking loosely, rust).



Charts by Russell H. Lenz

Some of Dr. Bowen's Evidence

These charts, printed in the order in which Dr. Bowen compiled them, show the notable regularity with which heavy rainfall occurs on certain dates in widely separated parts of the earth. These findings led him to discover a source outside the earth which he considers the cause of big downpours, on these particular dates, wherever rain clouds are ready to have their burden released.

These comet trails, these paths of dust, are always found in the same places because of the laws which hold this universe together. The earth passes through them on the same days each year, allowing for leap years and such.

At this point, evidence goes to work on a theory.

The dust first falls on the top of the earth's atmosphere, some 50 or 60 miles aloft. The bigger particles have enough energy to burn themselves up, due to friction with the earth's atmosphere. You see them as streaks in the sky, as "shooting stars."

The finer particles, however, don't have enough energy to burn and they sift slowly down through the thickening air.

At many places over the surface of the earth, they will find clear weather or clouds which hold little rain. There they will pass with no effect. But as always, there will be places where the cloud systems have piled up 40,000 to 50,000 feet, gorged with water vapor and ripe for conversion to rain. These would be seeded by the particles of dust and would unburden their heavy loads of rain.

Crystals 'Fool the Clouds'

"Seeding," is slowly beginning to be understood, though much research in this field remains to be done. Artificial rainmakers now sow crystals of silver iodide from airplanes, on the tops of the right sorts of clouds. These crystals are like ice crystals and fool the cloud into thinking that its time has come. They trigger the process of converting water vapor to snow or rain and the process then continues by itself.

This is what the meteor dust, after its own fashion, would appear to do. The question has been raised whether the amount of dust is enough for the purpose. But there stand the charts and the remarkable correlations which Dr. Bowen thinks convincing, as to what happens in fact. The means by which it happens will have to be developed. The story does not stop here. It may be that the effects of meteor dust will upset one's preconceived ideas about what causes rainfall. At present, it is generally accepted that the intensity and distribution of rainfall are determined by the pressure pattern. It might be that the reverse is the case: that the development of the pressure pattern is given major impulse by the time and amount of rain that falls.

Why might this be? It has been calculated that an inch of rain over a certain area causes the release into the atmosphere of the same amount of heat that would reach that area of earth in three days of sunshine. This is the familiar release of latent heat when water vapor condenses into liquid. Heat of this magnitude could set in motion major thermal actions and reactions, with major effect on the circulation of the atmosphere.

The heavy rains would then set up an air circulation pattern which could dominate the pressure pattern for many days.

A comment on weather forecasting. Obviously all this doesn't mean you can look at your dates for meteor showers and predict rain on Jan. 23. All you can say is that if further study bears out Dr. Bowen's charts and conclusions, and if there are no significant local deviations from the pattern, your area can expect heavy rain or snow on those dates once every so many years when cloud conditions are favorable.

Incidentally, it was early in January that Dr. Bowen arrived in Washington. On the 11th, which is officially recorded for technical reasons on the 12th, there were five inches of snow in the nation's capital, and on the 22d, which appears as 23d on the records, there were 6½ inches of the stuff. Doubtless to celebrate arrival of the theory.

What next? Dr. Bowen is on his orbit back to Australia, leaving a comet's trail of greatly intrigued and interested weather officials and students behind him. They will no doubt examine the largely untapped additional areas of rain records and project his findings onto a much wider statistical base.

What about long-term secular changes in the weather, changes that might send ice caps spreading outward from the polar cold, and then retreating over long periods of geologic time. Here Dr. Bowen merely opens a door for speculation; he has not yet assembled any evidence. Could they be caused by the solar system passing through what Dr. Bowen informally calls "a dustier part of the universe?"

If you would like to do research for some good dinner-table conversation, here is your chance. Dust pan and brush are in the kitchen closet. The cosmos is directly overhead.

THE MODIFIED GEISINGER INDICATOR

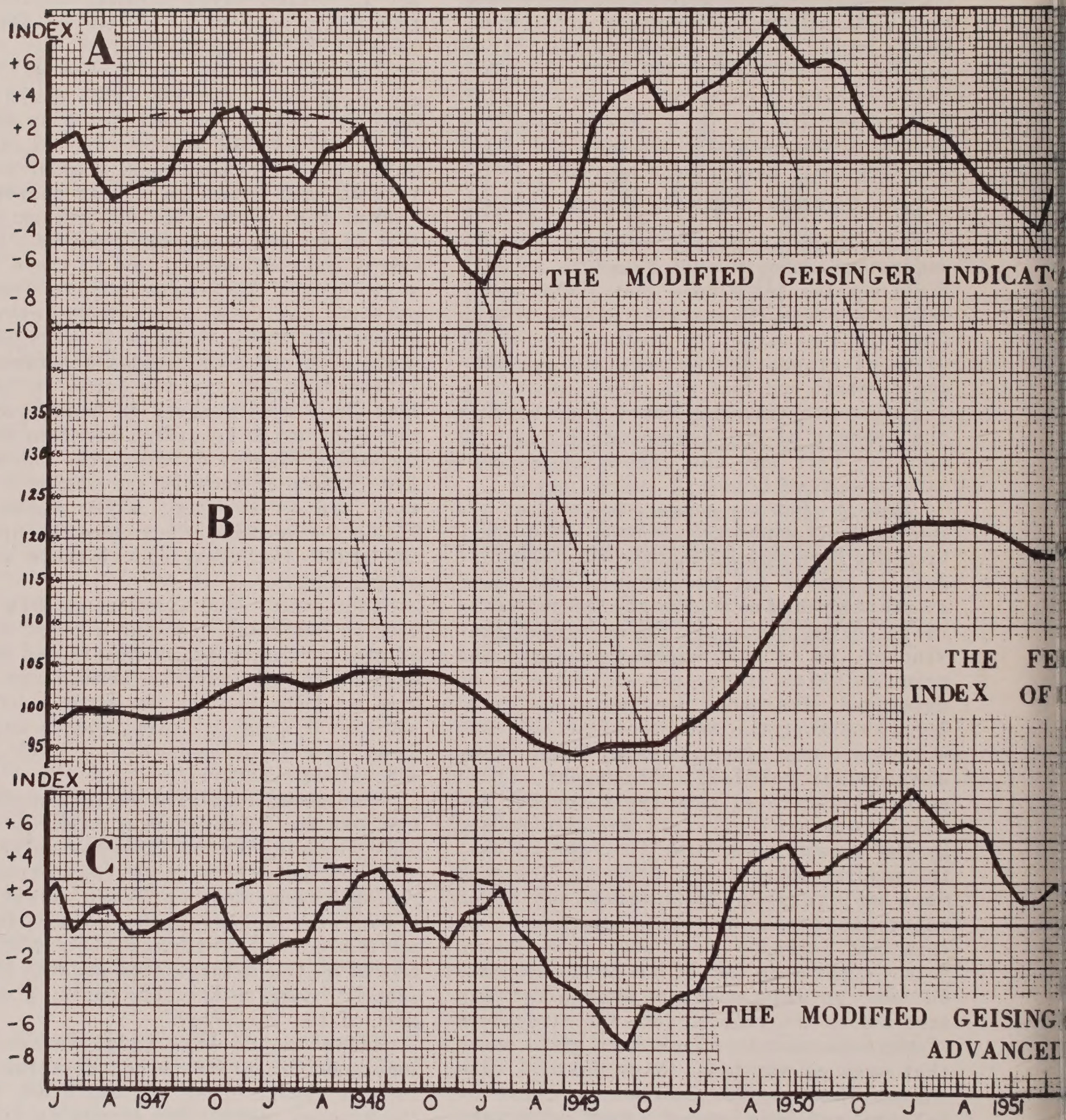
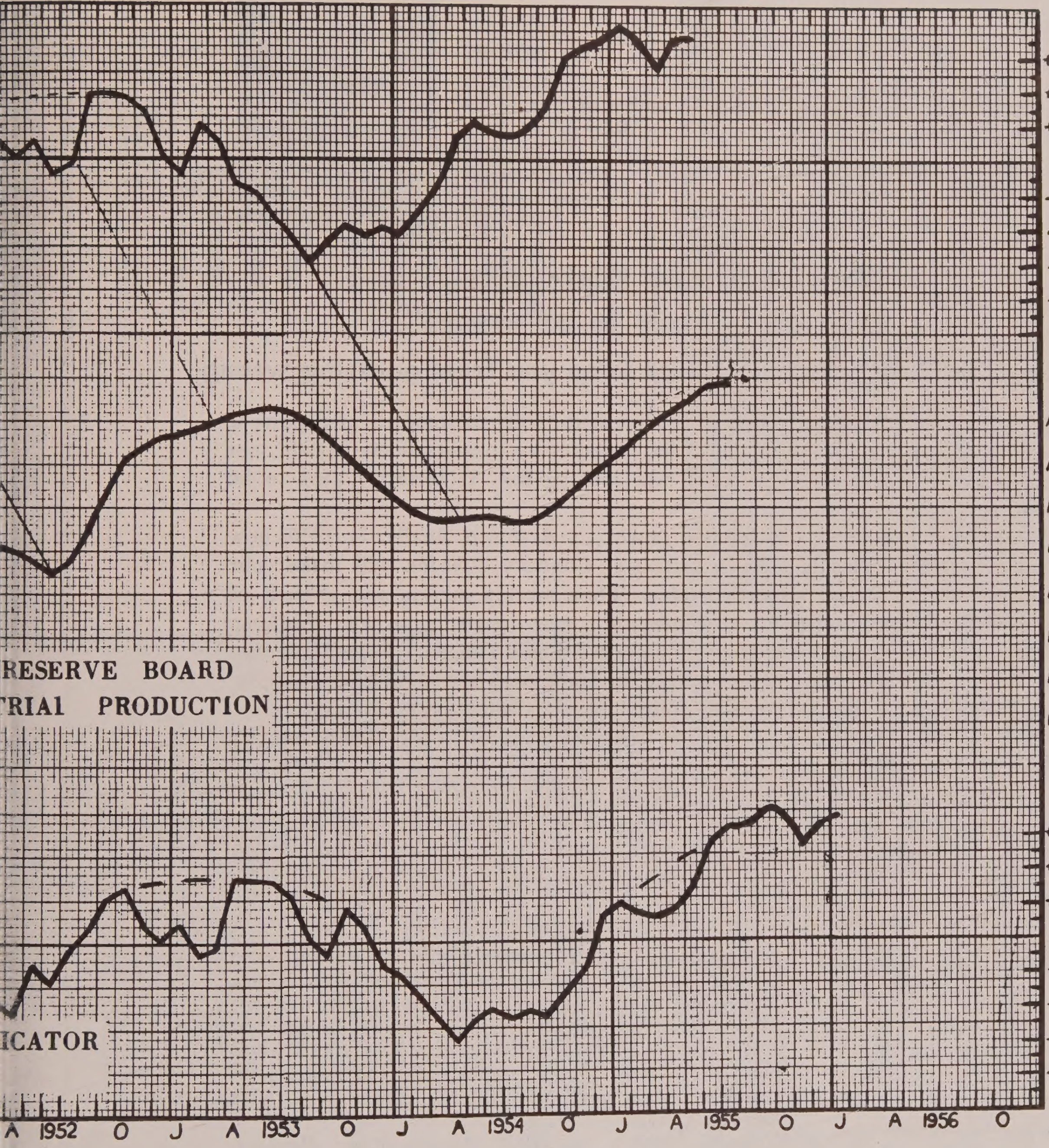


Fig. 1. Curve A. The Modified Geisinger Industrial Production Indicator Curve. This curve is derived from certain figures which are published monthly in the *Survey of Current Business.* It tends to turn about 8 months before the Federal Reserve Board Index of Industrial Production.

Curve B. The Federal Reserve Board Index of Industrial Production adjusted for seasonal variation and smoothed by a 3-month moving average. The value for the latest available month is shown by a dot.

Curve C. This Curve is the Modified Geisinger Industrial Production Indicator Curve advanced by 8 months. This process projects part of the curve into the future. If the relationships of the past continue, the projection gives some hint of what may happen to the Federal Reserve Board Index of Industrial Production (Curve B).

OF INDUSTRIAL PRODUCTION



THE FORECAST

The final figure for May (which, when projected becomes January 1956) is 7.2. This is a mild advance from 6.6, the figure for the previous month.

Based on this indicator, my own feeling for the near future continues to be one of optimism.

E. R. D.

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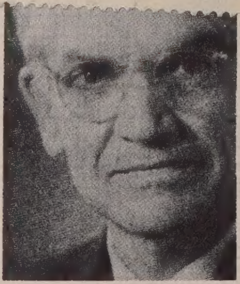

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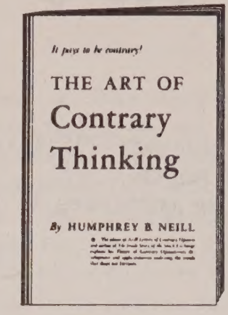

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